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OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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AUGUST 29, 1929.

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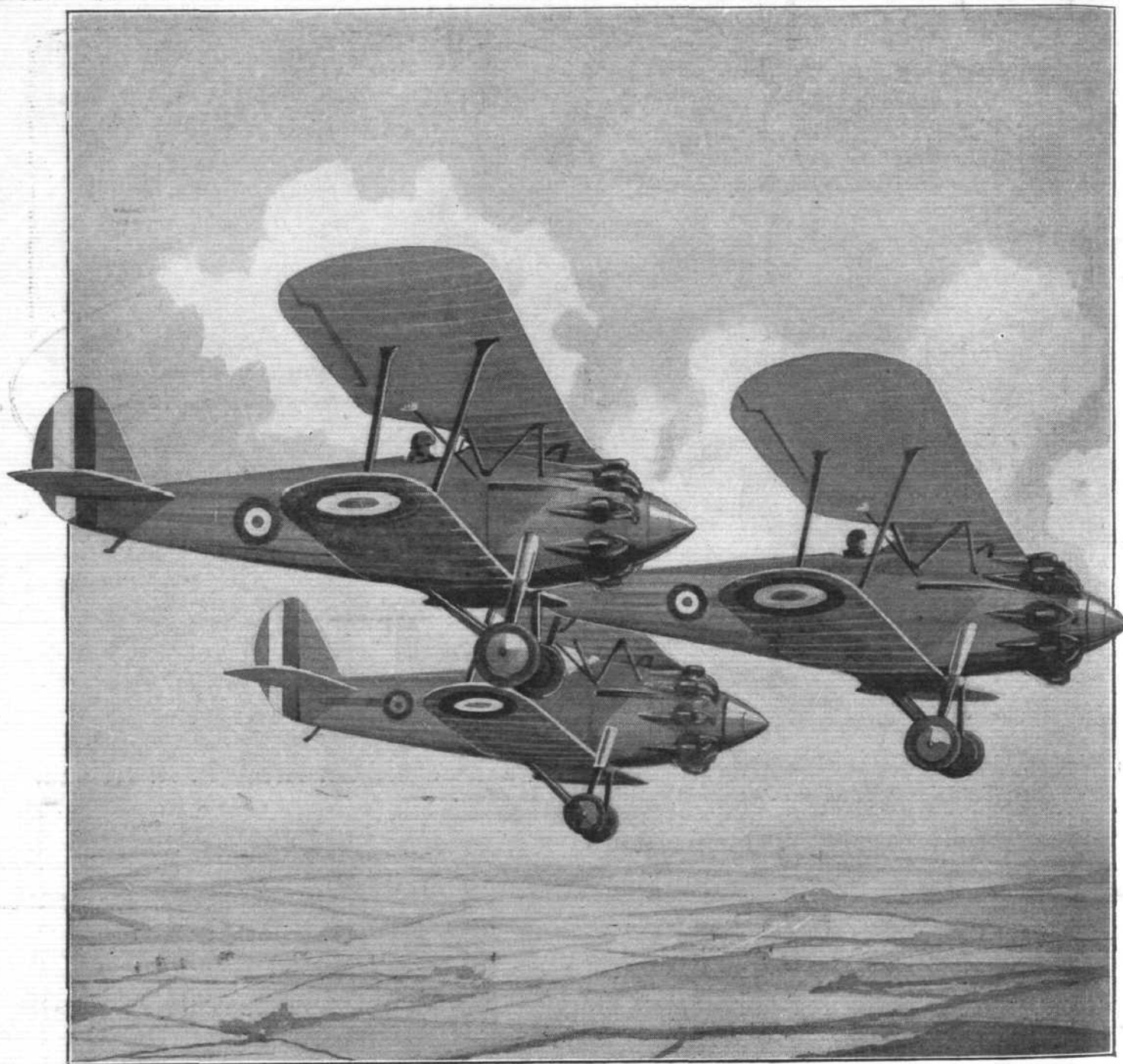
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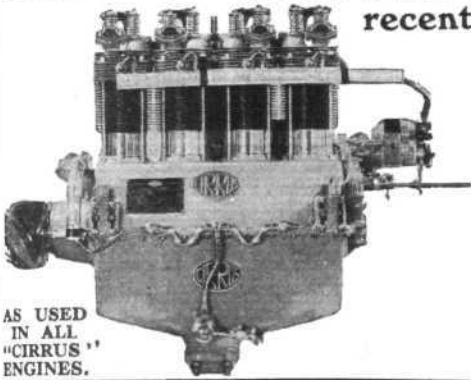
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"FLIGHT," SEPTEMBER 5.

### Schneider Trophy Souvenir Number.

Next week's issue of "FLIGHT" will contain a Special Illustrated Supplement in colour, giving concise details and the history of the Schneider Trophy Contest year by year from its "birth" in 1913 to the present year. As this issue cannot be reprinted, firm orders should be placed by readers with their newsagents to prevent disappointment in obtaining a copy. The price will be one shilling. Postage extra, 2d. inland, 3½d. abroad.

## EDITORIAL COMMENT



 RIDICULOUS as it may seem, although but one week separates us from the date fixed for the Schneider Trophy contest, it is still unknown officially whether there is to be an international contest or not. Conflicting statements have been appearing daily, one side claiming that Italy is not competing, and the next that Italy "will be there." But one thing appears to be certain, and that is that people who had planned to visit one of the seaside towns near the Schneider course will not be disappointed.

**To Schneider or not to Schneider** Whatever Italy ultimately decides to do, the British High-Speed Flight will send its machines around the course, and they will not "cruise" around either, merely to be able to claim a "fly-over." That much may be taken for granted. That the absence of foreign challengers would rob the contest of much of its interest is not to be denied. But the public should not be led by this possibility into staying away. It should be made quite clear that the Schneider Trophy contest is not in any case a "race" in that the machines, as in a scratch race, do not start together, nor do they, as in a handicap race, finish together. What happens is that the sequence of starting is decided upon beforehand, and contestants are then sent off at long intervals.

### DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

- |                     |      |  |
|---------------------|------|--|
| 1929.               |      |  |
| Aug. 31             | .... | Garden Party and Official Opening of Hantworth Air Park      |
| Aug. 31-<br>Sept. 1 |      | International Air Rally, Hadleigh, Suffolk.                  |
| Sept. 6-7           | .... | Schneider Trophy Race, Solent.                               |
| Sept. 10-20         |      | Aero Club de France Meeting, Le Baule.                       |
| Sept. 21            | .... | Air Rally at Haldon, Teignmouth.                             |
| Sept. 22            | .... | Bristol Aeroplane Club's Aerial At Home.                     |
| Oct. 1              | .... | Gordon-Bennett Balloon Race, St. Louis, U.S.A.               |
| Oct. 5              | .... | Newcastle Air Pageant, Cramlington Aerodrome.                |
| Oct. 10             | .... | Air Pageant and Light 'Plane Race, Hull Municipal Aerodrome. |
| Oct. 31             | .... | Guggenheim Safe-Aircraft Competition Closes.                 |

something like 10 minutes. The pilot is given the signal to start, and is allowed 10 minutes in which to get away. If he crosses the starting line in flight within that period, he is timed from the moment of crossing the line. But if he exceeds the 10 minutes period his time is taken as that at which he should have crossed the line. After an interval of 10 minutes or so, the next pilot is given the order to get away, and is allowed a period of 10 minutes, and so on. Under these conditions there is no question of a "race," and consequently, apart from the partisanship bound to exist, it matters relatively little, from an interest point of view, whether there are three or ten machines in the contest. Were it not for the fact that even with modern high-speed machines a competitor will take some 40 minutes to cover the seven laps of the course, and that thus, if there is a large number of competitors, it would take a whole day to run off the contest, each competitor might just as well complete his seven laps before the next competitor was sent away. It is only with a view to shortening the proceedings that more than one machine is in the air at a time. Only if by pure chance two competitors happen to be flying close together does the spectator have any opportunity to compare speeds. The reason for the wide spacing is, of course, that it is desired, and very necessary, that competing pilots should not be compelled to worry themselves about possibilities of collision in the air. The Schneider Trophy contest is, in fact, nothing more or less than a series of speed tests of a number of machines on the same day and over the same course. Of a "race" there can obviously be no question. We have elaborated this point at some length because the general public still regards the Schneider contest as a race.

Turning to the question of foreign participation in the Schneider Contest, everyone will sympathise most sincerely with Italy in the series of mishaps which have befallen her challengers, and some of which have, unfortunately, resulted in the loss of the lives of very fine pilots. No one will regret this more than do the members of the British Schneider Team. A "fly-over" is the last thing in the world which our pilots want, and we are quite sure that, keen as they are, they would rather be beaten by foreign

challengers than retain the trophy without opposition. But arrangements have gone too far for a postponement to be possible. The preparations made for transporting and accommodating the enormous crowds of visitors who will wish to see the contest are on such a colossal scale, and involve such large sums of money, that to postpone the contest is quite out of the question.

Italy is reported to have made the most elaborate preparations for the Schneider Trophy Contest, and to have built, it is stated, no less than 12 machines. That she has lost many of these is regrettable, but should not render her participation impossible by any means. The United States of America did not this year challenge with official machines, but left it to a private individual and private enterprise to represent the United States. Lieut. Williams has made a splendid effort, and his pluck and perseverance are greatly admired in Great Britain. For a single man to pit himself against the government resources of three nations (at the time of the entry France was a challenger) is a sporting action, the true merits of which we in this country can appreciate to the full. In this respect Williams has exactly reversed the position of 1923, when the Supermarine Aviation Works alone had a machine in the contest against pilots of the United States Navy. That he should have been unsuccessful in getting his machine to do what was expected of it will be very sincerely regretted by all on this side of the "Herring Pond." The very sporting action of America (under different conditions) in refusing to claim a "fly-over" the other year has not been forgotten, but America has not asked for a postponement of the contest, and the question of reciprocating the courtesy then shown Great Britain by the United States of America, does not, therefore, arise.

Italy's decision will not, we fear, be announced in time for us to include it here, but we personally believe that it will be found that there will be Italian machines in the contest on September 7. If there is none, the British public should still visit the scene of the contest. They will see some British machines that will give cause for admiration, and some piloting the excellence of which has never been exceeded anywhere in the world.

#### The Premier's Latest Flight

THE Prime Minister flew from Lossiemouth to Hendon last Saturday. A Westland Wapiti general purpose aircraft was the machine used this time, and stops were made at Cramlington and Catterick. Bad weather caused considerable delay, and he did not arrive in London until about 6.30 p.m.

#### Death of Lord Edward Grosvenor

It will be learned with much regret that Lord Edward Grosvenor died on Monday, August 26, in his 37th year. He was one of the earliest in this country to gain his pilot's certificate and joined the R.N.A.S., with his own Bleriot monoplane, at the outbreak of war. In September, 1925, he took over command of No. 601 County of London Sqdn., the first territorial Air Force Squadron. He was in charge of the British Team which went to the U.S.A. in 1924 for the Schneider Trophy Race.

#### An Interesting Appointment

It was announced on Thursday, August 22, that Group-Capt. H. M. Cave-Browne-Cave is to command No. 205 (Flying Boat) Squadron, at Singapore. It will be remembered that Group-Capt. Cave-Browne-Cave has already visited Singapore when he led the historic Southampton flying-boat flight to Australia and back to Singapore.

#### Galway to London Air Mail

On Monday, August 26, a large consignment of American mail was landed at Oranmore, County Galway, by motor launch from the North German Lloyd liner *Karlsruhe*, this together with some local matter was flown to Croydon, landing at 11.38 a.m., the letters being delivered in London at 4.30 the same evening. The machine was a Vickers "Vivid" (Napier) flown by Col. C. Russell and F/O Summers. By this means 36 hours are saved on the American mails and 24 hours on the local mails.

#### Air Conference at the Hague

THE International Air Traffic Association celebrated its 10th anniversary on August 26, with the opening of its 22nd session at the Hague. All European air companies were represented, and the visitors were welcomed by M. Reymer, the new Dutch Minister for Air and Waterways. Sir Sefton Brancker was amongst those present.

#### Air Mails in South Africa

THE Union's first air mail line was very successfully inaugurated on Monday, August 26, by the arrival at Durban of the mails 2 hrs. ahead of schedule. "Moth" aeroplanes are used and at East London the machine from Cape Town lands and another one takes over for the final stage to Durban. Roughly 36 hours are saved in the delivery of English mail.

# FIRST RUSSIAN ALL-METAL 'PLANE

[It is not often that FLIGHT has an opportunity to describe and illustrate aircraft designed and built in Soviet Russia. It is, therefore, with all the more pleasure that we publish below an account, written by Mr. J. Pogossky, of the ANT-9 monoplane. The description which follows, and the accompanying photographs, were sent us by the Joukovsky Central Aero-Hydrodynamical Institute of Moscow, and the writer is to be congratulated on his mastery of the English language, which is such that the article has scarcely had to be "edited" at all. As the performance figures given later will indicate, the ANT-9 is a machine which does its designer and the Russian Soviet credit. Its recent demonstration tour around Europe was very successful, and will have done much to raise the prestige of Russian aviation.—ED.]



The ANT-9 exhibited on the Krasnaja Ploschad in Moscow.

The two end parts (wing tips) of the main plane, along the trailing edge of which the ailerons are disposed, are secured to the middle part. Thus for purposes of railway transportation the main plane can be dismantled into three moderately-sized parts. For convenience in transportation of the machine as a whole, the wing tips only may be dismantled, and thus the overall dimensions of the machines are so reduced in size that it can be transported even in town.

The main members of the wing structure are four trussed spars, continuous over the whole length of the span. At the points of attachment of the wing tips, the spars of the central plane are secured to the corresponding spars of the wing tips. The spars carry a number of trussed ribs spaced 1 m. apart. The covering of corrugated Koltchugalumin of 0.3 mm.

thickness increased at certain places to 0.5 mm., is riveted to the spars and the ribs.

The strength of the covering is ensured by stiffening members disposed between the spars, parallel to them and riveted to the covering. This type of construction, consisting of four main spars, connected together by sufficiently strong ribs and especially by a metal covering, provides a stiff one-piece structure.

Tests have shown good results of such wings under various loadings, and the efficiency of the type of construction described in ensuring joint action of all the spars, as demonstrated by the negligible amount of torsion, observed during the tests. The body is suspended from the front and the rear spars of the plane by means of four steel angles. To the right and to the left of the body secured to the front spar of the central plane are placed the engine mountings, each fastened by four bolts, and the landing gear strut and the shock absorber. All the four wing spars are essentially similar in design. The top and the bottom booms of the spar, to which the covering is secured, consist of telescopic Koltchugalumin tubes entering into one another and dimensioned as required by the stress diagram. The inner bracing of the spar is also made of Koltchugalumin tubes. Thus the spar is a truss made entirely of this material. The members of this truss are connected together by gusset plates of Koltchugalumin sheet. As seen in one of the photographs, the gusset plates are on both sides of the truss and are

THE C.A.H.I. ANT-9 aeroplane is the first all-metal three-engined passenger aeroplane built in the U.S.S.R. (Soviet Russia).

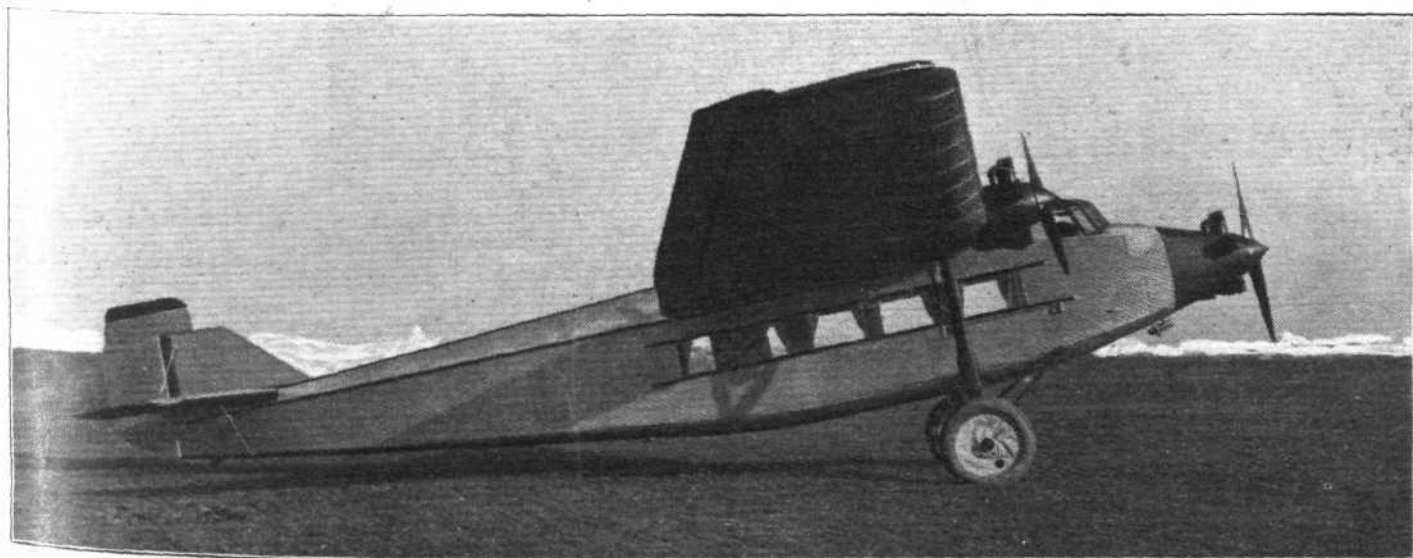
Before proceeding with a description of the design, it is well to mention that the construction of this large aeroplane was carried out in four and a half months, the machine being finished on April 28, 1929. The designing and the construction of the machine were carried out under the direction of Mr. A. N. Toupoleff, engineer-in-chief, who is in charge of all the all-metal aeroplane construction in the U.S.S.R.

The three-engined aeroplane C.A.H.I. ANT-9 is a cantilever-wing aeroplane, the main plane being disposed immediately over the body. In the interior of the body below the main plane is arranged a large passenger cabin, and at the forward end is the pilot's cabin. One engine is placed in the nose of the body, and the other two are in the main plane, one to the right and one to the left of the body.

The machine was built entirely of Koltchugalumin metal (tensile strength 40 kg./mm.<sup>2</sup>, elongation 20 per cent., specific gravity 2.85).

## The Main Plane

The main plane can be divided in plan into three principal parts. The middle part, which may be termed the central plane, is placed immediately on top of the body, to which it is secured by four bolts. To this part are secured the two wing engines.



FIRST RUSSIAN ALL-METAL PASSENGER AEROPLANE : Side View of the C.A.H.I. ANT-9.



THE ANT-9 : Three-quarter Front View.

riveted to web and flange members. The connections between the spars of the central plane and those of the detachable wing tips are of nickel chromium steel; the design of these connections is seen in the photograph on page 915.

A steel sleeve is slid on the Koltchugalumin tube of the boom of the central plane spar, and is fastened by rivets; into this sleeve fits a steel fitting, riveted to the spar flange of the wing tips. The steel fittings are joined together by a tapered bolt. There are such connections both in the top and in the bottom flanges of the spar; they are identical in design and differ only in dimensions.

At the point of attachment of the engine mounting struts and of the landing gear struts, the front spar of the central plane is provided with suitable steel fittings.

The leading edge of the central plane is hinged to the front spar and can be easily detached, thus making possible a convenient inspection of all the interior of the wing, and maintenance of the petrol and oil tanks disposed in the interior of the wing, and of all their piping.

In the middle part of the wing are disposed only the main fuel tanks, other tanks being placed in the wing tips. Such a disposition of the tanks over almost the whole length of the wing is of great advantage from the point of view of load distribution, and leaves the whole of the body available for passenger arrangement.

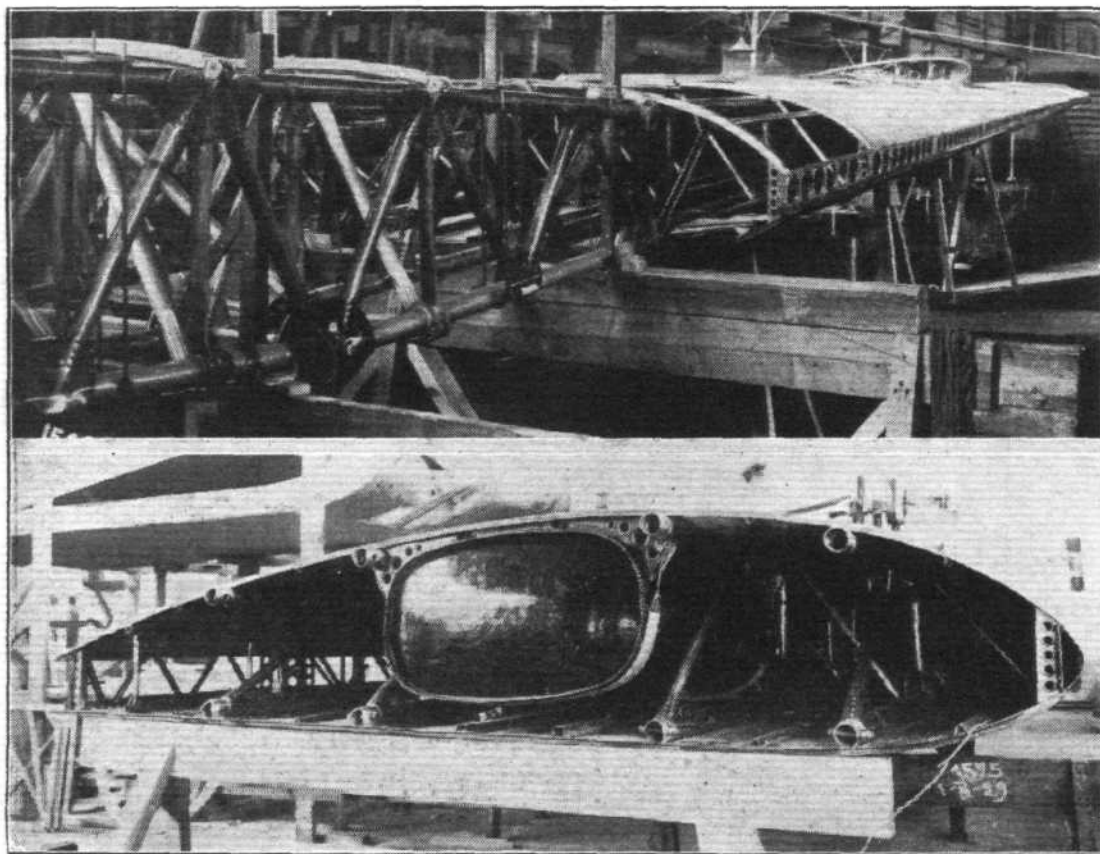
The ailerons are made entirely of Koltchugalumin and are covered with corrugated sheet metal. In the middle part of the wing, above the body, there is a spacious luggage compartment.

### The Body.

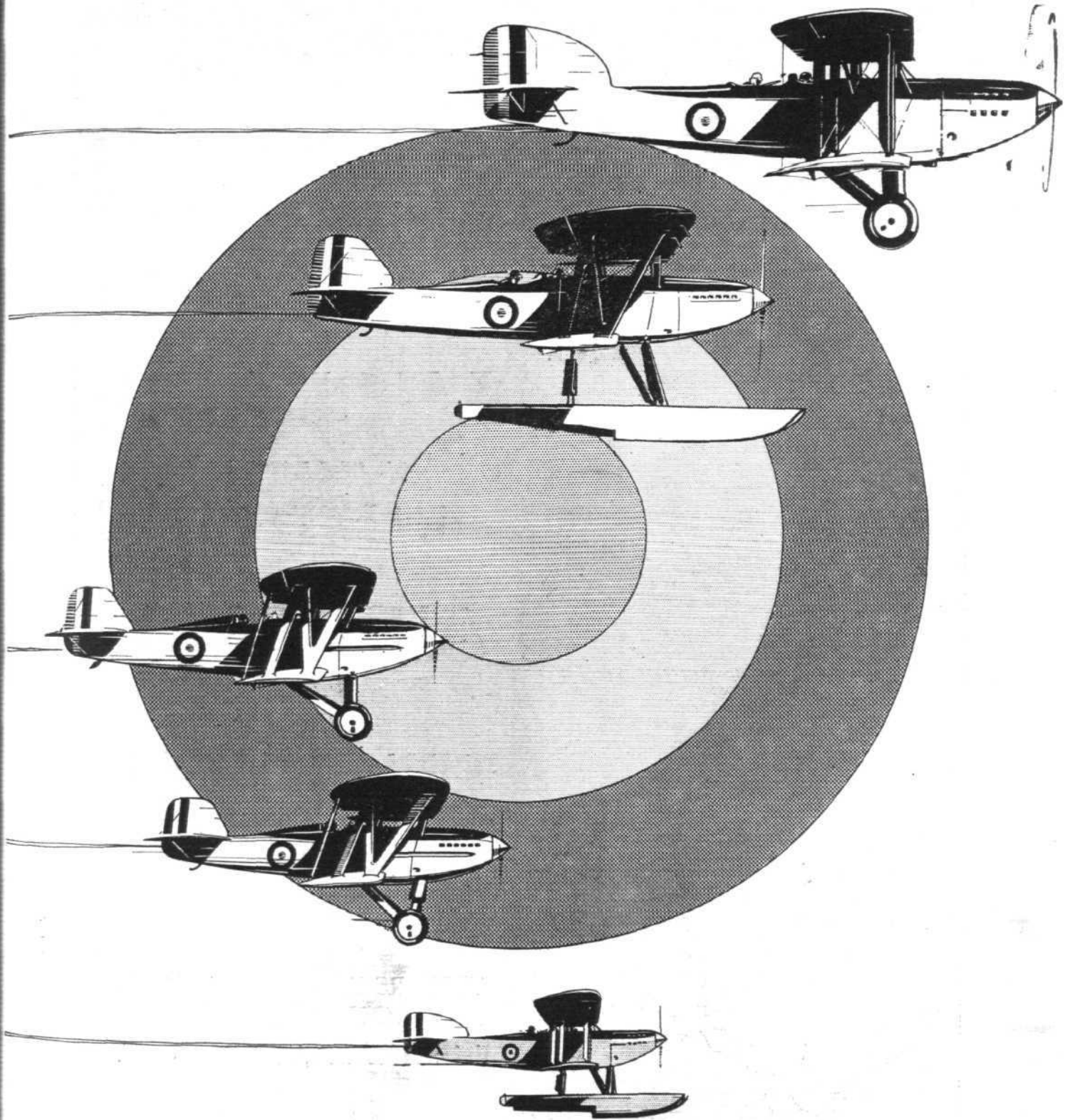
The body is made entirely of metal, and for convenience of description will be divided into three parts: The forward part, from the nose of the machine to the forward end of the passenger cabin, carries a detachable engine mounting made of steel tubes, and similar in design to the wing engine mounting. Aft of the engine is the pilots' cabin, provided with two conveniently arranged seats. The dual control can be disconnected at will. The vision forward, skyward, and lateral is ensured by a number of large windows. The interior arrangement of this part of the body is clearly seen in one of the photographs on p. 916:

Beneath the pilots' seats and a little in front is the forward luggage compartment. Structurally this forward part of the body, as well as the middle one, represents a truss, built of Koltchugalumin structural sections and tubes, encased by corrugated Koltchugalumin sheets of 0.3 mm. thickness. The two longerons of the body, by which it is secured to the main plane, contain two main body frames. These frames are provided with steel fittings, on which are set lugs projecting from the central plane of the wing, and the entire body is kept together by four bolts.

The middle part of the body forms a spacious cabin for nine passengers. The seats are of the wicker work type and provided with cushions; they can be folded at will. If necessary, only four seats can be left, while the other five can be converted into berths, arranged in a very convenient and original manner, as it is seen from the other photograph on p. 915. At the end of the passenger cabin is a



Structure of wing centre-section, with outer wing portion attached. Below, the inner end of wing tip, with fuel tank. Note socketed joints for attachment of multi-spars.



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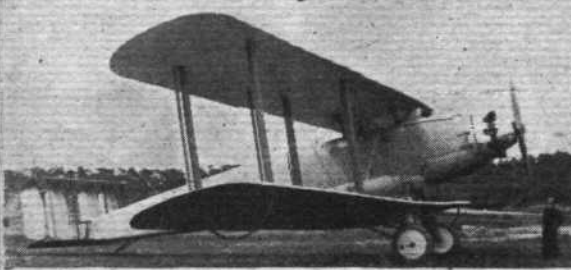
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toilet room, a compartment which can be used as a wardrobe and an additional luggage compartment. The rear part of the body, from the passenger cabin to the tail, is of a construction fully utilising the strength of the metal covering. It consists of a number of lateral frames built of Koltchugalumin tubes and structural sections, and of four longerons placed along the edges.

Between the frames are, in addition, diagonally disposed Koltchugalumin bands. Such a design, in which a load-carrying covering is stiffened by lateral frames, ensuring its rigidity and in which there are additional longerons and bands, disposed in the direction of maximum stresses, provides a structure unit capable of withstanding all the loads from the tail.

#### The Tail

The fin, the rudder, the tailplane and the elevator are built of Koltchugalumin tubes and structural sections and are covered by Koltchugalumin sheet of 0.3 mm. thickness.

The tailplane comprises three spars. The middle spar is provided with three projecting steel lugs, which are fastened by bolts to fixed corners of the body; about this pivot the tailplane can be rotated to change its angle of incidence.

The rear spar is secured by four bracing cables (two from above and two from below) to a vertical column, which can be raised, or lowered, by the pilot.

#### The Engine Mountings

All the three engine mountings are detachable, and are secured each by four bolts. They are identical in design, and are made of welded tubes.

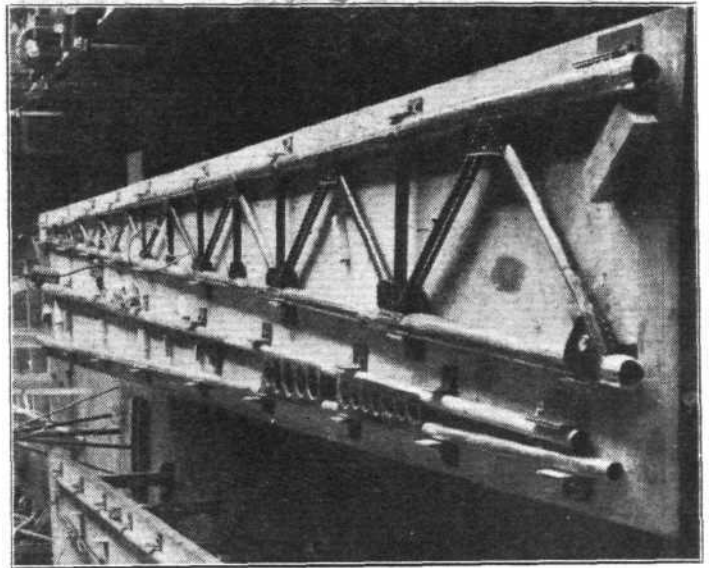
A steel tubular ring is provided with special fittings, carrying the crankcase of the engine. The ring is connected to four joints braced by eight steel tubes to corresponding fittings of the wing.

This framework is redundant, but ensures a wholly reliable mounting of the engines, and is free from any objectionable vibrations. This arrangement is shown in a photograph on p. 916.

#### The Landing Gear

The landing gear is divided into two parts, one on each side of the body. The wheel is mounted on a semi-axle made of high-strength nickel-chromium steel. The joint adjacent to the wheel is formed by three intersecting members, viz., the semi-axle, the front bracing member and the vertical landing gear strut with the shock absorbers. A pyramid is thus formed, with the wheel at its apex. Obviously, this pyramid takes up all the loads from the wheel.

The vertical strut is constructed in the following manner. The upper portion terminates in a tube fitting into the lower



The wing spar construction : Booms as well as braces are of Koltchugalumin tubes.

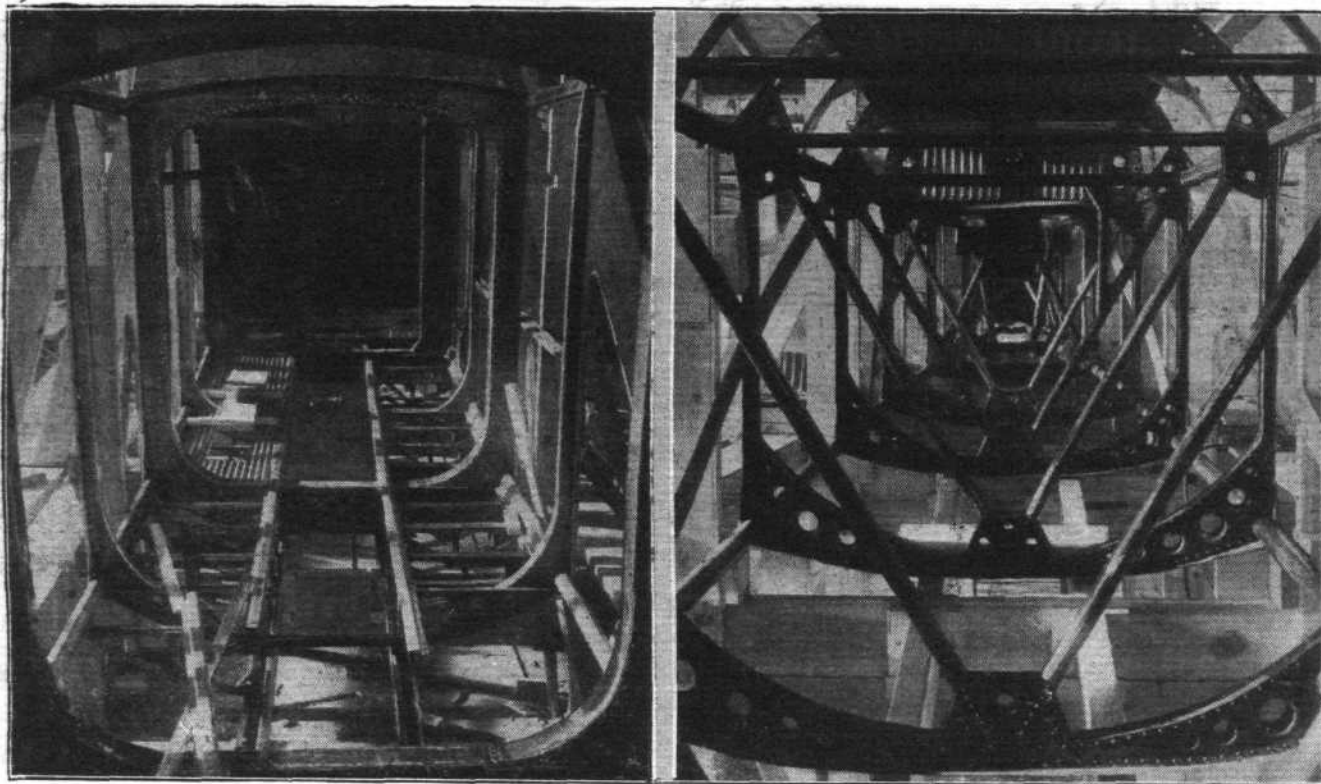
portion as a piston into a cylinder. Between the two portions are placed streamlined drop-shaped plates of rubber, alternating with Koltchugalumin spacers. These rubber plates working in compression are excellent shock absorbers on landing. In addition to them, there are provided inside the upper portion of the strut the so-called reverse shock-absorbers. The direct and the reverse shock absorbers are given initial compression, ensuring their efficient functioning. The lay-out of the landing gear is shown in the photograph on page 917.

The main dimensions and areas of the ANT-9 are as follows :

Span .. ..	23.740 m. (77.8 ft.)
Length overall .. ..	17.0 m. (55.75 ft.)
Height .. ..	4.86 m. (15.9 ft.)
Wing area .. ..	84 m. <sup>2</sup> (905 sq. ft.)
Tail plane area .. ..	6.1 m. <sup>2</sup> (65.7 sq. ft.)
Elevator area .. ..	4.5 m. <sup>2</sup> (48.4 sq. ft.)
Tail fin area .. ..	2 m. <sup>2</sup> (21.5 sq. ft.)
Rudder area .. ..	2.43 m. <sup>2</sup> (26.2 sq. ft.)
Aileron area .. ..	8 m. <sup>2</sup> (86 sq. ft.)



The Saloon of the ANT-9 : View looking forward. The pilots' cockpit can be seen through the open door in the front wall.



**FUSELAGE CONSTRUCTION OF THE ANT-9 :** On the left, the saloon portion, showing main frames. On the right, the structure of the aft portion of the body, in Koltchugalumin tube construction.

The tail plane setting angle can be varied from + 6 deg. to - 0.5 deg.

The weight of the machine empty is 3,353 kg. (7,375 lbs.). It should be noted that this figure was increased owing to the machine being fitted with wheels, semi-axles, and other fittings heavier than required for a machine of the given weight.

The disposable load is made up as follows :—

Weight of the crew (a pilot and a mechanic, or a second pilot) .. .. .	160 kg. (352 lbs.)
Weight of nine passengers .. .. .	720 kg. (1,584 lbs.)
Luggage and tools .. .. .	110 kg. (242 lbs.)
Fuel and oil .. .. .	700 kg. (1,540 lbs.)
<b>Total .. .. .</b>	<b>1,690 kg. (3,718 lbs.)</b>
<b>Total flying weight .. .. .</b>	<b>5,043 kg. (11,093 lbs.)</b>

The wing loading is 60 kg./m.<sup>2</sup> (12.25 lbs./sq. ft.), and the power loading 7.32 kg./h.p. (16.1 lbs./h.p.). "Wing power," 8.20 hp./m.<sup>2</sup>

The capacity of the eight main petrol tanks in the detachable wing tips is 540 kg. (1,190 lbs.), and the total petrol capacity is 1,180 kg. (2,600 lbs.). Capacity of oil tanks, 100 kg. (220 lbs.).

The performance shown by the ANT-9 machine during the official trials, carried out by the Governmental Commission is as follows: (total flying weight 5,043 kg., of which available load 1,690 kg.).

Max. speed near ground .. .. .	209 km./h. (130 m.p.h.)
Speed at 3,300 ft. .. .. .	200 km./h. (124 m.p.h.)
Speed at 6,600 ft. .. .. .	192 km./h. (119 m.p.h.)
Speed at 10,000 ft. .. .. .	182 km./h. (113 m.p.h.)

Minimum speed, near ground, 120 to 130 km./h. (74.5 to 81.5 m.p.h.). The climb to 1,000 m. (3,300 ft.) occupies 6.46 mins.; to 2,000 m. (6,600 ft.) in 15.48 mins.; to 10,000 ft. in 30.7 mins.; and to 3,810 m. (12,500 ft.) in 60 mins. Service ceiling, 12,500 ft.

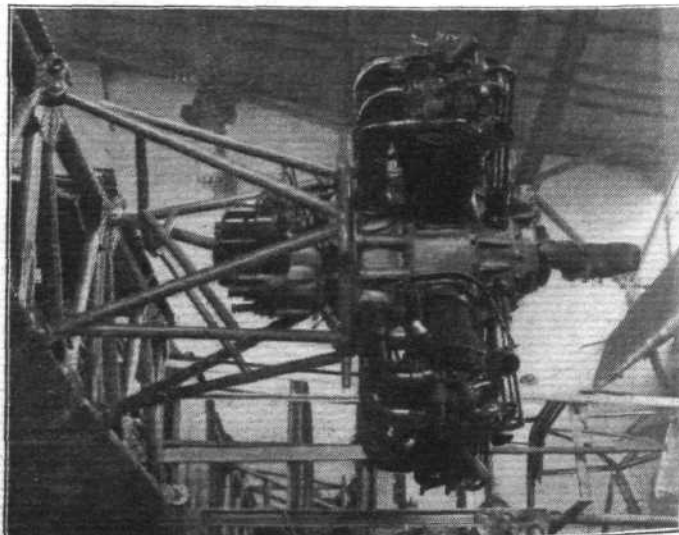
With one engine stopped, the maximum speed at full throttle near the ground, is 170 km./h. (105 m.p.h.), and the ceiling is approximately 3,300 ft.

The performance during cruising speed tests, with engines throttled to 1,500 to 1,520 r.p.m. (about 63 per cent. of the b.h.p.), was cruising speed 170 km./h. (105 m.p.h.), at which the fuel consumption was 100 kg. (220 lbs.) per hour. Hence the flying range for the normal petrol capacity of 640 kg. (1,400 lbs.) is about 670 miles. With the tanks filled to their full capacity of 1,180 kg. (2,590 lbs.), the range is increased to 1,800 km. (1,115 miles).

Stability tests have shown the machine to be easily manœuvrable and perfectly stable at all the ranges for different positions of the centre of gravity corresponding to the typical dispositions of loads. Taking off and landing are normal and very easily made.

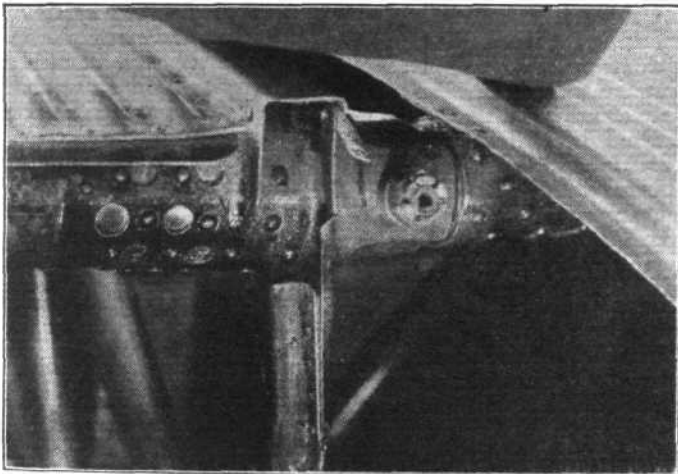
After the completion of the official trials the ANT-9 machine made a round trip from Moscow via Odessa, Sebastopol, Odessa, Zinoveffsk, Kieff, making a total of 4,000 km. The 1,255 km. distance from Moscow to Odessa was covered without landing. The start from Moscow was made with an overload of 500 kg. (1,100 lbs.), as there was the full number of passengers on board. The time of flight from Moscow to Odessa was 7 hrs. 12 mins., the average speed being 175 km./hr. (108.5 m.p.h.).

Taking into account the very adverse meteorological conditions during the flight, viz., low clouds, almost incessant rain, and frequently contrary wind, the speed obtained must be regarded as very satisfactory. Owing to low clouds the whole trip from Moscow to Odessa was made at a height of from 25 to 75 m. The Odessa-Sebastopol-Odessa route was traversed in a straight flight over the sea. The meteorological conditions during the return journey were no better, but the average speeds obtained were of the same order. The



**A Wing Engine and its tubular mounting on wing centre-section.**

engines showed good performance. The flight was accomplished without any forced landings and delays, which is a testimony both to the good qualities of the machine and the degree of perfection that was attained in a prototype machine, permitting it to be regarded as a working unit to be included into the series.



View from above, showing landing gear, front portion of fuselage, and wing engines. Note the neat engine cowling. On the left, detail of tubular wing spar boom joint, for connecting centre-section to outer wing portions.

#### Manchester Aerodrome Granted Customs

THE Wythenshawe Aerodrome at Manchester, from which the Northern Air Lines operate has been granted customs authority for aircraft until February 28, 1930.

#### Prince of Wales Adopts Luxor Goggles

H.R.H. THE PRINCE OF WALES has just purchased a pair of Luxor goggles fitted with curved hand-ground Acetex lenses.

#### Air Minister's Air Tour of R.A.F. Squadrons

LORD THOMSON OF CARDINGTON, the Secretary of State for Air, arranged to make a tour of inspection by air of certain R.A.F. Bases this week. He started from Northolt Aerodrome last Monday and inspected Tangmere, Gosport, Lee-on-Solent, Calshot, and Worthy Down during the following three days. He was then due to fly to Grantham, Halton, and Uxbridge, terminating the tour by Saturday.



The course of the first airship flight round the world, now almost girdled. The Graf Zeppelin has only to cross the Atlantic from Lakehurst to complete its circle of the globe in four stages, the shortest of which will be over 2,000 miles and longest over 7,000 miles. ("FLIGHT" Copyright.)

# AIRISMS

## FROM THE FOUR WINDS

### Graf Zeppelin's World Flight

THE *Graf Zeppelin* continued her journey on the "second hop," leaving Tokyo on the afternoon of Friday, August 23. On the way over she experienced a bad buffeting in a Pacific hurricane but sustained no damage. At noon on Saturday she reported her position as about half-way over, and the wind having become favourable, she completed the crossing at an average speed of nearly 80 knots. She arrived over San Francisco at 18.00 hours on Sunday evening, and was welcomed by swarms of aeroplanes. Continuing down the coast, she reached Los Angeles at 1.16 hours in the morning, and as there was no necessity for a night landing, she cruised round till dawn. Her arrival was broadcast to Germany and was well received in Berlin, and listeners were able to hear her engines and the cheers of the crowds as she was finally moored up at 5 o'clock. The distance covered from Tokyo to Los Angeles was 5,800 miles, and it was completed in 78 hrs. 58 mins. Not wishing to delay the flight unduly, Dr. Eckener left Los Angeles at midnight on Tuesday and was due at Lakehurst on Wednesday, August 28.

### Air Mail Record

A RECORD Indian mail, consisting of over 30,000 letters, left Croydon in an air liner last Saturday. The liner carried eight passengers bound for various points along the 5,000 miles of Imperial Airways London-India route.

### Altitude Record

THE altitude record for aeroplanes carrying a weight of 500 kg. (about 1,100 lb.) is reported to have been broken at Toussus-le-Noble by an airman named Burten in a Breguet biplane with a 500 h.p. supercharged Farman engine. The barograph recorded a height of 9,500 m. (31,168 ft.). The previous record was 9,188 m. (30,145 ft.).

### Mails by "Catapult"

A MAIL carrying seaplane—a C.A.M. biplane with Lorraine-Dietrich engine—was again successfully launched from the *Ile de France* on August 26, when off the Scilly Isles; she landed at Le Havre and the mails were delivered in Paris about 24 hours earlier than had they gone by the normal route.

### U.S. Air Rules

IT is reported from Washington that new air regulations will come into force in America on September 1, which will embrace drastic new air tests for pilots. These new rules

are said to be decided upon in order to end the increasing number of air accidents in America, which are thought to be due to inexperienced piloting.

### Successful Autogiro Tests in America

SEÑOR DE LA CIERVA successfully demonstrated the Cierva Autogiro at Philadelphia recently. The experts who observed these trials were greatly impressed, particularly with the extremely rapid ascent which has been obtained through recent improvements.

### Canadian Air Mail

CANADIAN Colonial Airways carried 12,585 lbs. of mail during the month of July, which is a slight increase over June figures. During the second quarter the total carryings southbound from Montreal to Albany amounted to 4,967 lbs., though the north-bound movement from New York was greatly in excess of this figure.

### Stag Lane to Oslo in One Day

MR. LIEF LIER, pilot of the Gipsy Moth carried aboard the Norwegian whaler ss. *Kosmos*, now sailing for the Antarctic on an expedition, flew the machine after delivery from Stag Lane to Oslo in one day, by way of Ostend, Amsterdam, Hamburg and Copenhagen, a distance of about 975 miles, in 8 hours 55 minutes flying time. Mr. Lief Lier figured in the search for General Nobile last year.

### Dusting by Air

A VANCOUVER report states that, as a preliminary experiment, an area of 100 acres in the Indian River district will be "dusted" with calcium arsenic from a Western Canada Airways, Ltd., flying boat. This is being done in an effort to halt the depredations of the hemlock looper, a caterpillar which has been doing great damage to standing timber in the district. Should the experiment prove to be successful, the powder will be used extensively in the area.

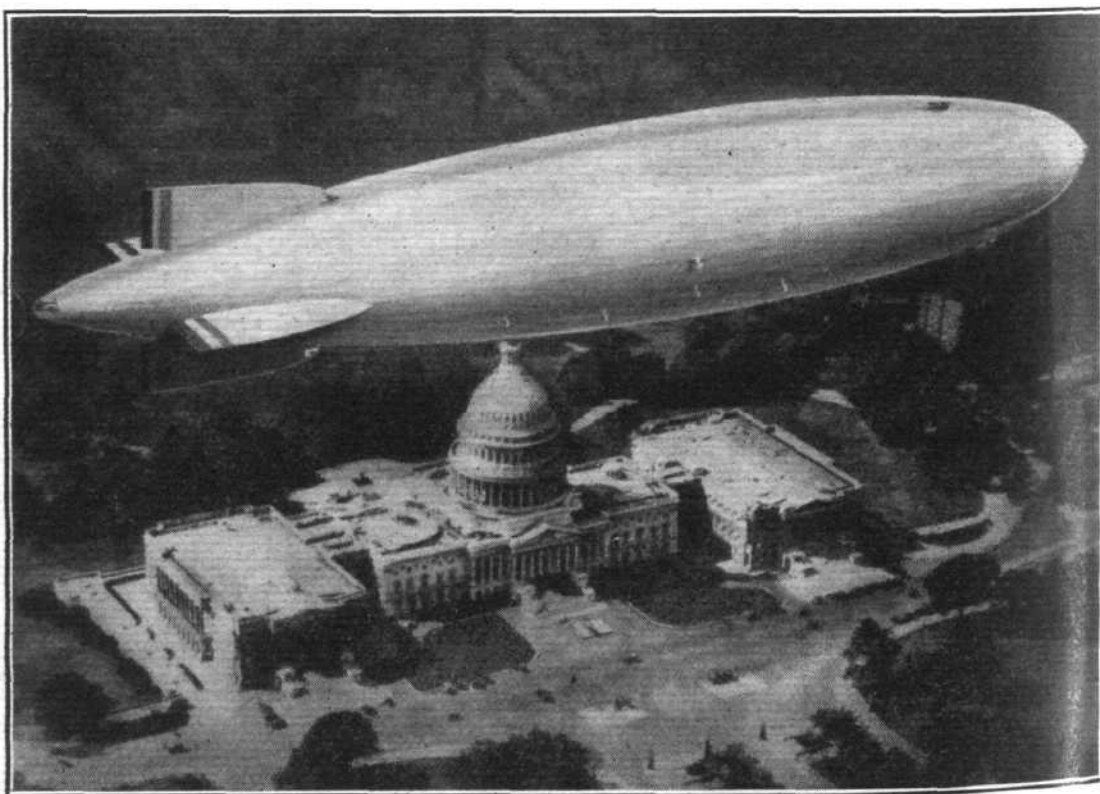
### A Spanish-Italian Air Agreement

AN air agreement between Spain and Italy was ratified recently by the Spanish Prime Minister and the Italian Ambassador to Spain.

### American Airwomen's Derby

THE American Air Derby for women, which was flown in several stages from Santa Monica to Cleveland, a distance of 2,350 miles, ended on Monday, August 26. Mrs. Louise Thaden was the winner in 20 hrs. 19 mins., and 15 of the 20 starters finished.

**Proposed U.S. Navy Airship:** A drawing of one of the two new Navy dirigibles to be built by Goodyear, and how it will appear when piloted over the United States Capitol at Washington. The length of the United States Capitol is 750 ft., while the length of the Navy airships is to be 785 ft.



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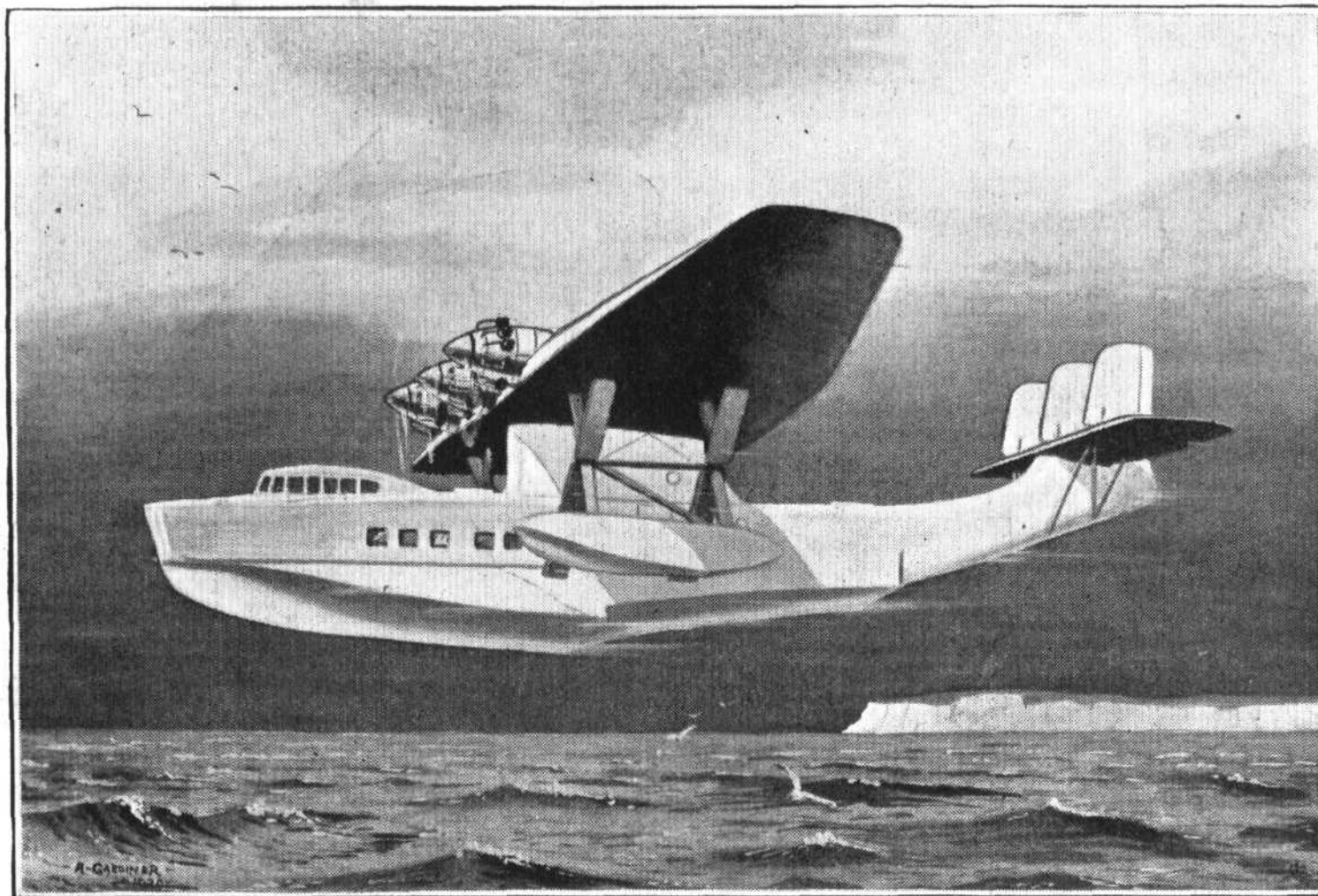
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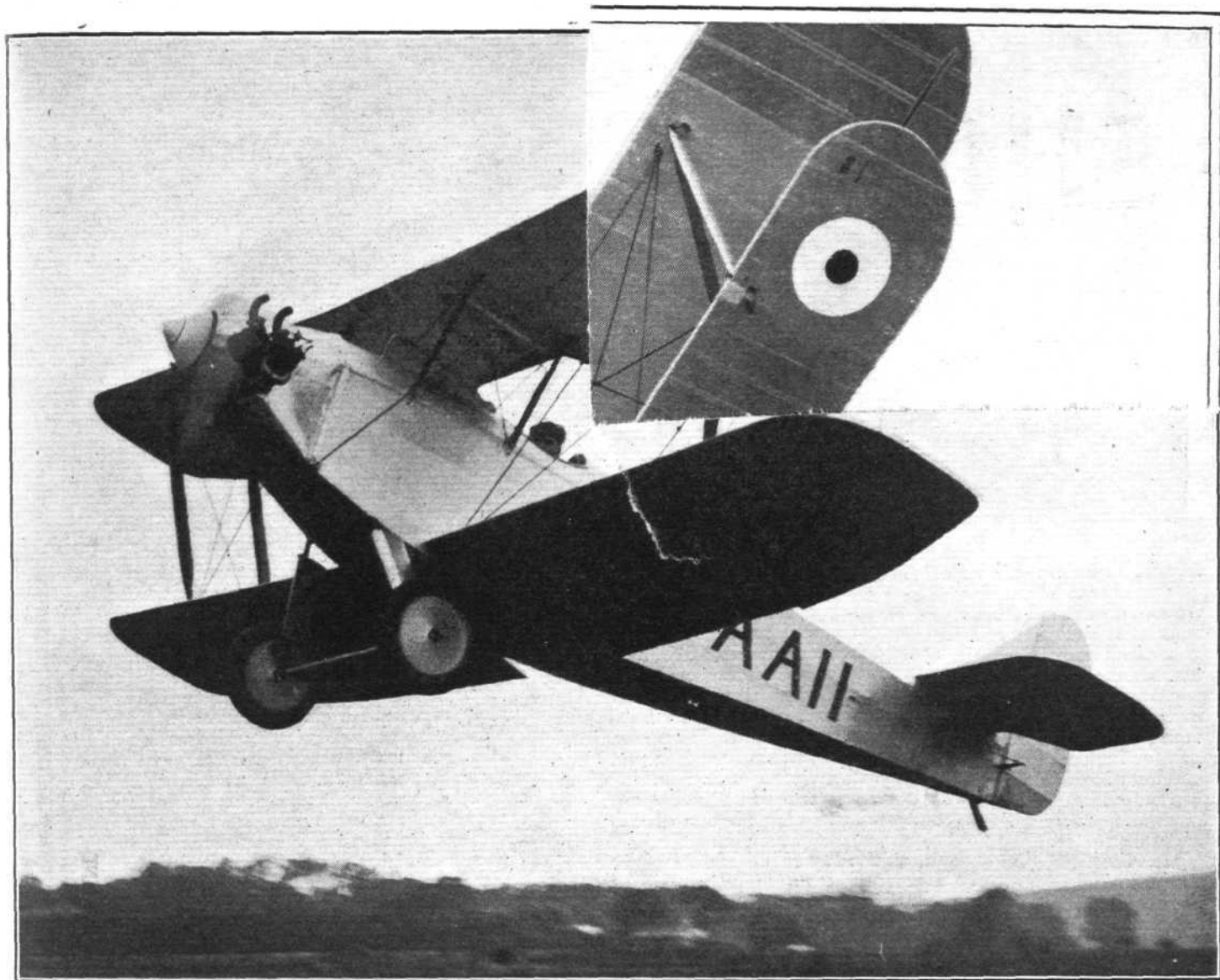
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## THE "MARTLET"

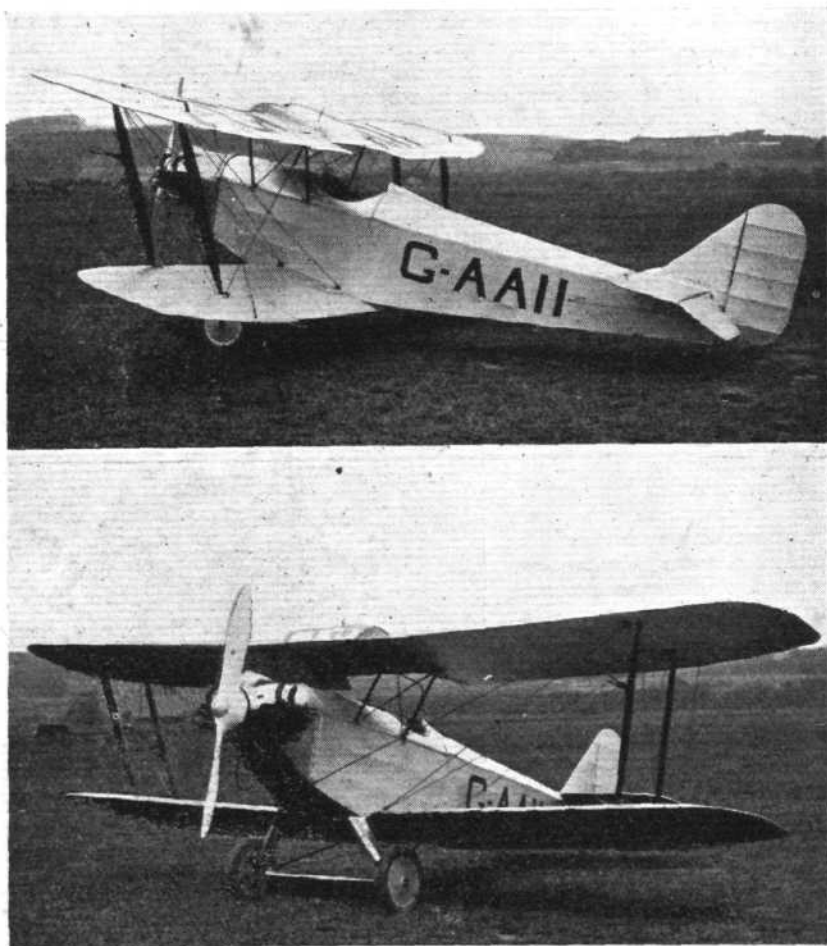
### A Highly Successful S.A.L. Conversion

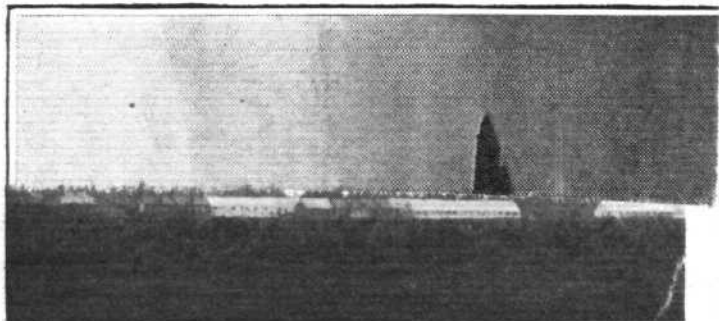
**A**N Avro "Baby" has recently been converted by Southern Aircraft, Ltd., of Shoreham-by-the-Sea, into a very modern light 'plane single-seater, with a quite amazing performance. We had an opportunity, recently, of inspecting and photographing this machine at Shoreham, just prior to its going away to Martlesham for type tests.

The work of converting the "Baby" has been extremely well carried out, and Mr. F. G. Miles, of Southern Aircraft, Ltd., is to be congratulated upon the work. The main alterations carried out were, directly and indirectly, a result of the decision to fit an A.B.C., "Hornet" engine. This engine, being a double flat twin, called for an engine mounting and cowling totally different from that which the machine had originally, when fitted with the Green four-cylinder in-line water-cooled power plant. The difference in weight between the Green and the "Hornet" also played a part, and Mr. Miles produced the "nose" shown in the photographs, particularly in the three-quarter front view. We think it will be agreed that the "Hornet" nose is a very workmanlike affair.

To bring the machine into line with modern practice, it was decided to fit a top centre-section gravity petrol tank, and this has been done, the wings being for the rest left unchanged.

A slight rearrangement of the cockpit was also effected, notably the installation of new controls. A new tail unit was designed and made, and it

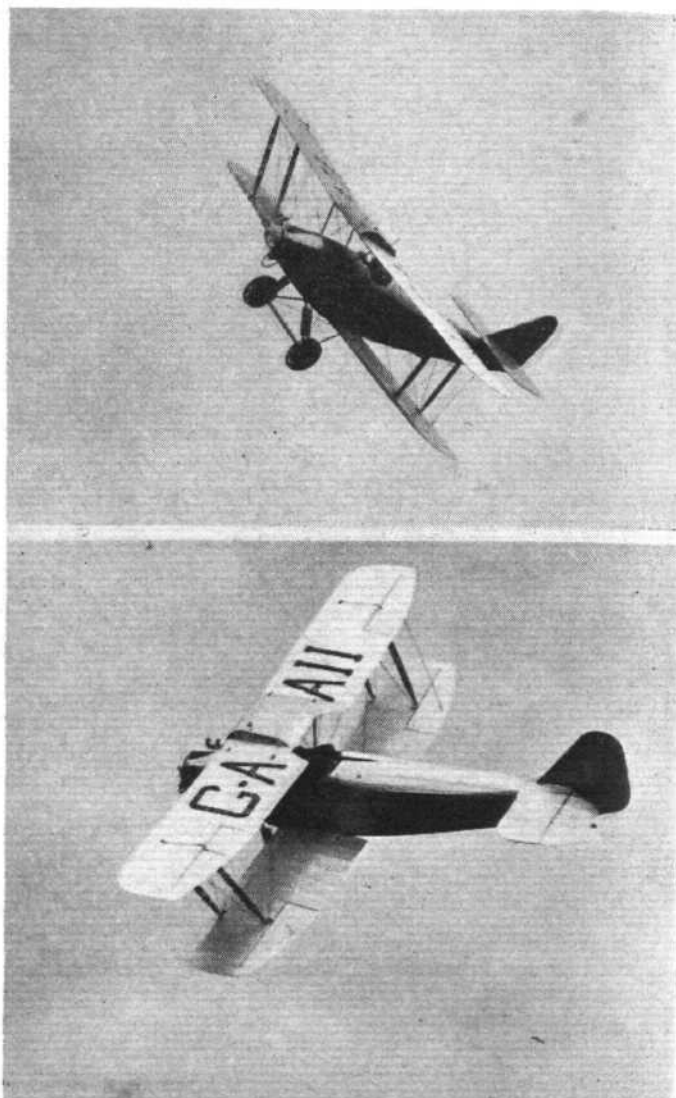




will be seen that this rather resembles in general shape the tail of the Avro "Avian," so that the "Martlet," as the converted machine has been christened, still retains a good deal of the Avro "touch."

Rubber cord shock absorbers having gone out of fashion, Mr. Miles fitted a new undercarriage, in which the telescopic legs incorporate oleo gear and coil springs. This type of leg is the invention of, and has been patented by, Mr. Basil Henderson, of the Hendy Aircraft Co., also of Shoreham, but owing to certain patent considerations, we are not able at present to give a detailed description of it. That it works extremely well was demonstrated when Mr. Miles landed and taxied the machine about in very small curves at high speed.

Mr. Miles was kind enough, on the day of our visit, to take the machine up and give a most amazing demonstration of its capabilities. The take-off is extremely short, and the climb is reminiscent of a single-seater fighter. The machine does all the usual aerobatics with great facility, and Mr. Miles showed, by flying around in small circles at very low speed, that the controllability is good, even near the stall. The high speed also appears impressive, and altogether, the "Martlet" promises to be a very fine little machine for the pilot-owner who desires something "snappy." The machine is, we understand, the property of Mr. Bellairs, a director in Southern Aircraft, Ltd. Finally, it should be stated that the A.B.C. "Hornet" appears to run very well indeed, and

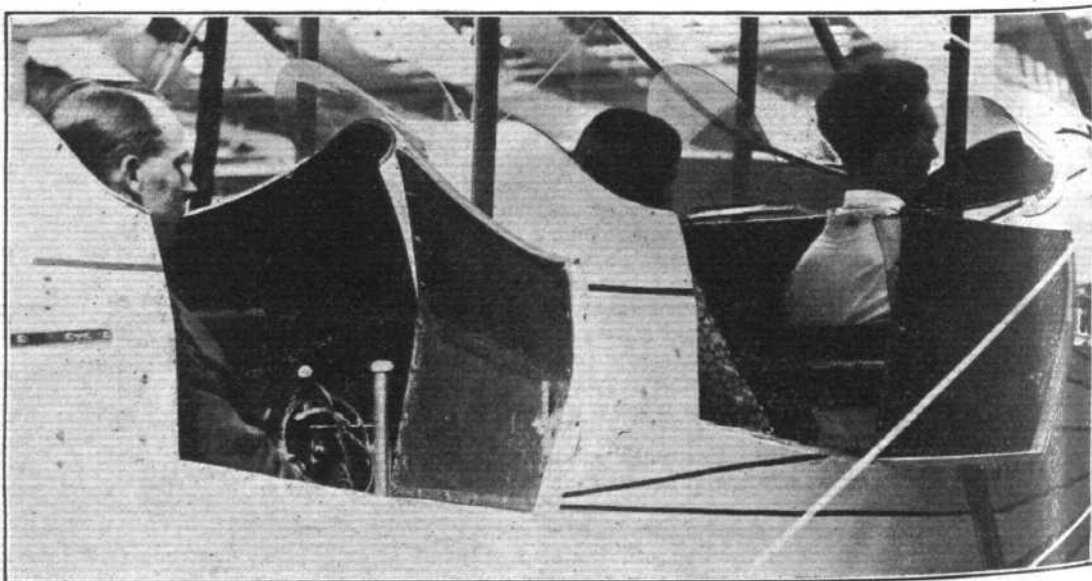


to give ample power. The machine lands very slowly, and is exceptionally manoeuvrable on the ground, with the result that it should be easy to "put down" in almost any field. Its short run to take off, and its excellent climb, should enable it to get out also of very small fields, so that the "Martlet" may be considered a very serviceable little single seater indeed.

#### German Flying-Boat Over Hull

A BIG German flying-boat passed over Hull on August 20th. It was flying very low, and appeared to be only a few feet above the roofs of the highest buildings, the identification marks on the wings being clearly visible.

**Spartan Ingenuity:** The front cockpit of the three-seater Simmonds "Spartan" has a very clever seating arrangement whereby the front passenger may sit either facing forward or facing aft. The back-rest is hinged in such a way as to be capable of being swung upwards out of the way, as is also the middle windscreen. When the machine is used as a two-seater, a special cover is provided which covers the front part of the cockpit. If desired a slightly longer cover can be fitted, which completely covers the cockpit opening and may be used if the machine is flown solo. ("FLIGHT" photo.)



Travelling at high speed, it flew in the direction of the River Humber. Inquiries in London revealed that the machine was a Rohrbach Romar three-engined monoplane belonging to the Lufthansa Company, the great German organisation for commercial aviation.

Hawker Horsley  
Torpedo Carrier



# ROLLS-ROYCE

## AERO ENGINES

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[“FLIGHT” Photograph.]

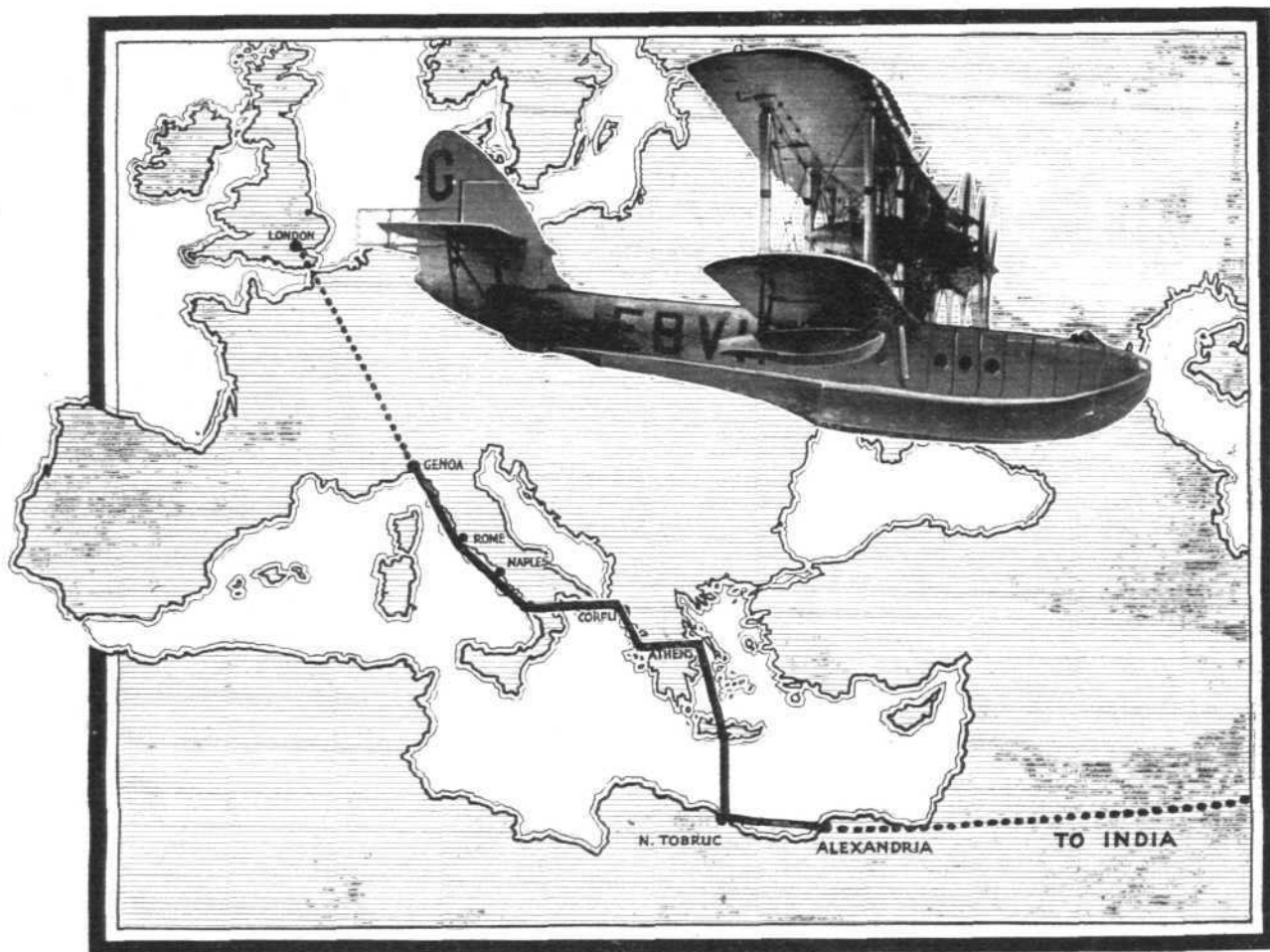
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August 29, 1929

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EDITORIAL VIEWS

With the Schneider Trophy Contest impending, aeronautical interest is centred at the moment on that event. Olympia is a thing of the past. Nevertheless, in a week or two aeronautical engineers will have time in their offices and room in their brains to revert to the Olympia Aero Show and the lessons (if any) it had to teach. Mr. Pollard, who is in charge of metal construction at the Filton works of the Bristol Aeroplane Co., Ltd., this month reviews the outstanding features, as regards metal construction, which impressed him at Olympia.

Mr. Pollard's comments on the subject, monoplane or biplane, looked at from the structural rather than the aerodynamic point of view, are illuminating. He calls attention to the fact, probably known by many aircraft engineers, but not, perhaps, as generally realised as it might be, that in a cantilever monoplane the forces in the spar booms are large, owing to the relatively small depth of girder, and that as a result of this, the structural material can be used more economically than in a biplane structure, where the forces are smaller and where, moreover, sudden concentrations of load occur which make it difficult to proportion the structure members to give uniform stress. Mr. Pollard advances the opinion that during the next few years a great deal of experience will be obtained, on monoplanes, in the economic use of materials.

A large portion of the remainder of Mr. Pollard's article is devoted to an examination of the probability of engine failure and forced landings in single-engined, twin-engined and triple-engined aircraft. The subject has, on the face of it, little enough to do with metal construction, but the discourse on black balls and white balls may amuse some readers. Without wishing to enter into an argument with Mr. Pollard, we think that he makes the same mistake as have so many others of making no allowance for the fact that in an aircraft with more than one engine, failure of one engine always results in the rest of the engines being run at higher power, and thus increases (presumably) the chances of their breaking down. We do not say it would be an easy matter to make allowance for this in any mathematical treatment, but the fact is bound to have a not unimportant bearing on the probability of forced landings.

METAL CONSTRUCTION AT OLYMPIA.

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.S.

Probably most of the readers of these notes availed themselves of the opportunity of visiting Olympia, and made a first-hand study of many of the excellent exhibits shown there. In consequence of this consideration, and of the fact that a full description of many of the details of structural interest in machines on view appeared in the supplement of the issue of this journal for July 11, it is not proposed to occupy any considerable part of the space available for this article with descriptions of details of machines, but rather to make a general survey, and to base thereon such deductions as the facts appear to warrant.

What, then was the predominant note in the galaxy of exhibits?

Certainly most types of construction were there, and almost all conceivable combinations of useful materials were to be seen. Bearing in mind the fact that no machine is ever made solely of timber, steel or duralumin, it will be appropriate to the object of our "survey" if we take as a basis of comparison the materials used in the primary structures of the machines. Doing this, we find that the relative numbers made from the various materials worked out roughly as follows:—

	Per cent.
Timber .. .. .	21
Duralumin .. .. .	19
Steel .. .. .	33
Timber and steel .. .. .	10
Timber and duralumin .. .. .	6
Duralumin and steel .. .. .	11
	100

The preponderance of steel constructions over any other single material is thus made evident.

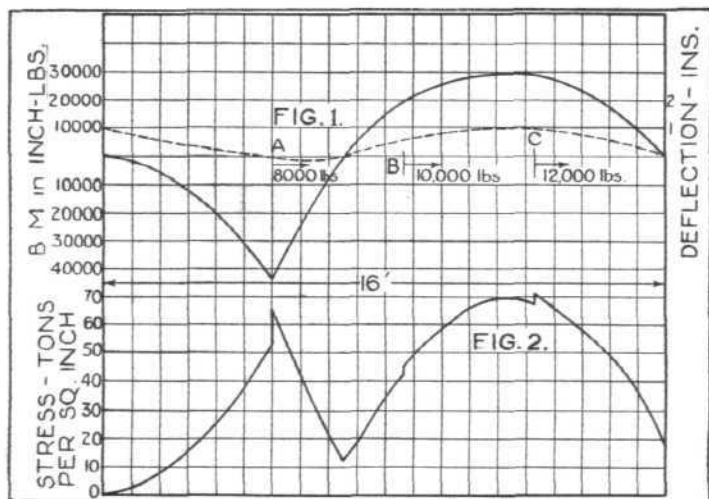
Most of the machines of timber construction were of the light plane or "private owner" class; a notable exception however was the Blackburn Bluebird IV. The structure of this machine (the wings in particular) was a really good example of up-to-date metal construction.

The question of the relative stiffness of members made on the one hand from steel and on the other from duralumin is often debated. The argument for the general adoption of duralumin members is that, since material 2·8 times the thickness of steel can be used without increase of weight, the stouter duralumin member must necessarily be stiffer. The leading edges of the wings of the Bluebird was the

# THE AIRCRAFT ENGINEER

strongest possible argument against this. I was informed that the member (an open channel made from a single strip) was made from steel; it was certainly quite thin, and although it could be deformed by hand pressure, after the pressure was removed the section sprang back to the original shape. This is in contrast to the usual behaviour of a corresponding duralumin member, which under similar handling may easily be deformed permanently in spite of the extra thickness. The low limit of elasticity of duralumin is clearly the weak point in the armour of its partisans. Returning, however, to our general survey, the diversity of methods of construction shown was, as evidenced by the comments heard, a source of wonder to many visitors, even to engineers, and the question was again frequently asked "which method and which material is 'the best.'"

It is difficult to see why this diversity should be perplexing, since at least as great a diversity is to be found in many other branches of engineering. Looking again very briefly into the matter we may say that if a metal aeroplane is required (a) for experimental work only, or for limited production where only a small expenditure on manufacturing equipment is possible, and (b) a comparatively heavy structure is of little consequence, welded steel is probably the best. A lighter and possibly more airworthy structure can be obtained by using duralumin or high grade steel tubes, but apart from such special considerations, the form of construction that will ultimately yield the lightest, most airworthy, and relatively the cheapest structure is that in which high tensile steel strip is used.



Arguments in support of these statements based on the experience of the last few years have already been stated in this journal. That we have only touched the fringe of this matter of light metal construction is realised by those with experience in the design and building of such structures. Progressive improvement with four principal objects in view is to be expected, these objects being:—

- (1) Utilising materials to greater advantage by the development of higher average stresses than have yet been attained.
- (2) Cheapening of production.
- (3) Lengthening the life of machines.
- (4) Making repair work easier.

As illustrative of the first point, consider the fibre stresses in the wing spar of a "single strut" biplane such as the "Siskin," "Bulldog," or "Gamecock." The interplane strut and drag strut attachments being at A, and the other drag strut attachments at B and C, Fig. 1, take the constants of the spar as:

$$\begin{aligned} y &= 2.25 \\ I &= 0.8 \\ Z &= 0.355 \\ A &= 0.3 \end{aligned}$$

The dotted line in Fig. 1 shows the deflection at all points along the span, and the full line the bending moment at corresponding points. The end loads at A, B and C are indicated.

Fig. 2 gives the compressive stresses in the flanges. At two points only are the stresses high, whilst the average intensity of fibre stress is only 27 tons per square inch. If the stresses are taken out at various distances above and below the centre line, the average intensity of stress will be found to be very low indeed. The combinations of shear stresses with direct stresses have, of course, to be considered. In this connection it may be said that the usual formula for shear stress

$$f_s = \frac{F}{I_1 b} \int y b dy$$

appears to be totally inapplicable to these thin box type spars; but in spite of every consideration there can be no question that only a very small proportion of the section of the metal in a wing spar is stressed up to anywhere near the yield point of the metal. The present orthodox type of construction will undoubtedly be superseded by methods in which the material is used more economically. Experiments which are now being made to investigate the development of higher average stress in the metal tend to show that lighter structural design will not necessarily be accompanied by complication in manufacture, rather the reverse, so that costs should not be increased.

Whilst on this point we may, with advantage, probe into this problem a little deeper. It is claimed in some quarters that the answer to the call for lighter structures lies in monoplane development as an end in itself. In the light of fundamental principles it can be shown that this cannot be the case, for from the simple fact of extra depth of girder the biplane should always be lighter than a monoplane. Why then is it that biplane structures are not so very much lighter than good monoplane structures? Take first of all, the case of a pure cantilever monoplane: here we have the simplest kind of structure. Within the limits of aerodynamical accuracy the loads in the members can be calculated with great precision. The forces in the booms are large, compared with the forces in the spars of a biplane, simply because of the smaller depth of girder. Consequently, it is possible to use the material more economically over a greater part of the structure. To make this point quite clear, suppose a compressive force of 0.25 tons acts between two points, and a stress intensity of 40 tons per square inch is required. Then the area of metal

permitted is  $\frac{0.25}{40} = 0.00625$  square inches. A suitable

compression member could not be made having such a small area, and consequently in this particular case a much lower stressed member would have to be used. This elementary example merely shows that in general a more economical use of metal can be made where large forces are concerned than in the case of small forces. Then again it is relatively a simple matter to design a monoplane girder in which the bay lengths are small, and which consequently involve correspondingly low values of slenderness ratio  $L/K$ . In such a girder also the principle of lamination can be extensively applied, the aim being a structure of uniform and maximum possible stress. Similarly with the shear members; these being of short length, high values of  $P/A$  can be employed. Again, in the cantilever monoplane, so far as air forces are concerned, there are no points at which sudden changes of load occur. Consequently sudden variation in stresses are avoided, but as we have seen, in members subjected to sudden changes in load the design is settled at the worst stressed point or points, the average stress being necessarily low, much variation in sectional area of member being difficult in spar members as at present designed for biplanes. In a biplane, therefore, with the strut and wire attachments, the attachment of one lifting surface to another where possibly well distributed loads near a spar end are suddenly concentrated at a bolt or bolts and transmitted to another principal member through lumps of metal, together with the great variation in stress along the member as shown in Fig. 2, the economic use of material is really a difficult matter. In the light of the foregoing considerations, therefore, it would appear that a period of monoplane construction is possible during which time a great deal of experience will be obtained in the economic use of materials; whether or not at a later

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date it may be possible to use such accumulated experience on biplane structures, time alone can decide.

The above argument may not appeal very forcibly to some readers; if it does not, one would ask the interested reader to take any biplane he likes to choose, and to design for it a spar which has fairly high and tolerably uniform stresses throughout its length. A trial then at laminating such a spar in a practical manner will probably convince him of the difficulties of the problem. Summarizing, then, we may say that monoplane design in steel strip will teach us a great deal that will ultimately prove of value in biplane design.

A special case of the economic use of material was to be seen in the mono-spar wing. (Readers are referred to FLIGHT, June 13, 1929, for a description of the wing.) It would be of interest to know what proportion of the upward load would be sustained by this structure when applied in the opposite direction, probably a fair proportion. The difference in the designs of the upper and lower booms, however, was the first thing that caught the eye. Another thought comes to mind when seeing this mono-spar wing, and that is the attachment of concentrated loads, particularly engines. Wings of more orthodox design certainly seem more suitable for the installation of engines, particularly when the engines are approximately in line with the leading edges of the wings, then, for the best results, they must be put well in front, thus leading to other stress problems. Mr. Stieger probably has an answer to this. Nevertheless, the weight of a structure to carry wing engines, either "on stilts" above the wing, or a frame projecting from it, or on an underslung arrangement, might easily seriously lower the ratio:

area of load supporting surface  
weight

In these days of wing engines, the question of how far the weight of the lifting surface is increased by engine supports is a matter of importance.

As to the third and fourth points quoted above, there has, up to the present, been no particular need for "long life," as many machines have become obsolescent in their experimental stages; but with increasing efficiency and reliability, length of life and the desirability of making easy repairs after accidents will become an increasingly important factor. In the matter of long life we look to the use of stainless steel as the solution. Such a steel, having a proof stress of 70 tons per sq. in., and of sufficient ductility to withstand a bend round a radius of one time the thickness of the strip "along the grain," i.e., parallel to the direction of rolling, is promised. The additional cost of such a steel over ordinary steels will easily be repaid by its extra durability. Savings in obviating the use of preventive processes against corrosion will go far in this direction. Under this head it may be noted that the weight of paints and preservatives on steels may, in an ordinary two-seater steel aeroplane, add as much as 30 lb., and this is a dead loss in carrying capacity.

Metal construction of itself cannot make aircraft a competitor with other forms of transport. Of greater importance is reliability, and as regards engines, the greater the power "reserve" the greater the reliability ("reserve" is here used in a wide sense), and from this fact, and the fact that multiple engines may seriously affect the structure weight, one feels justified in including in this article a note on the probability of forced landings of machines using one, two or three similar engines. As far as I remember, Mr. J. D. North published investigations into this problem some years ago, but I cannot find the reference, nor do I know whether the actual proofs of his results were given. If the following method of attack is different, but the conclusions reached are the same, then that in itself may be regarded as sufficient justification for a deviation into a subject which cannot strictly be considered as metal construction development.

In attacking any problem for the purpose of getting a mathematical solution, the conditions assumed must be clearly visualised. The assumptions made for the purpose of attacking this problem are (a) that the reliability of all six engines (single, two- and three-engined machines) is the same and (b) that engine failure (i.e., failure of a single engine) occurs on the average during a definite number of hours of flying.

The first assumption carries with it the factor of the decreasing reliability with age which occurs in engines—that is to say, the engines in the three-engined machine are assumed to have no longer probable life than those in the two-engined or single-engined machines.

On the second assumption the point to notice is that the period over which the records of failures are kept must be so long that the true average is obtained. To keep our ideas clear we will take one hour to be the unit of flying time, so that if the records show one engine failure in 1,000 hours' flying, the probability of failure in any single hour's

flight is  $\frac{1}{1000}$  or, in more popular language, the odds on

"getting there" in one hour's flying time will be 999 to 1. Later on we will discuss flights of longer duration.

It is clear that in a twin-engined machine, which can fly only if both engines are running, the two engines being each assumed to be equally reliable to the one in the single-engined machine, an extra unit of unreliability is introduced. That is to say, there are two chances of failure against one in the single-engined machine. This makes the probability

of a forced landing  $\frac{2}{2000}$  or the odds on "getting there"

in the one hour's flight are 499 to 1. The possibility of being able to prolong the glide and so choose a suitable landing ground may be a small factor in counteracting the disadvantage, but that does not concern us here.

If we have a bag containing 1,000 similar balls, of which 999 are white and one is black, and if we liken the drawing of one ball to one hour's flying, and we take the drawing of the black ball to represent an engine failure, we have the same mathematical problem—that is to say, the probability of drawing the black in one draw is—

$$\frac{\text{Ways of drawing black}}{\text{Total possible ways of drawing a ball}} = \frac{1}{1000}$$

This corresponds to a single-engined machine. If, then, there are two bags, each containing the same number of balls, the two taken in conjunction will represent a twin engined machine, and the drawing of a ball from each will represent one hour's flying. The drawing of two white balls will correspond to "getting there." The drawing of a black and a white ball corresponds to an engine failure and a forced landing. The two blacks coming out together corresponds to failure of both engines at the same time.

It is clear then that if any one ball is drawn from the first bag, the draw from the second can be made in 1,000 ways. Further, as each of the 1,000 balls in the first bag can be drawn as against one actually drawn, the total number of ways in which two balls can be drawn is  $1,000 \times 1,000$ . We shall require this later. As to the number of ways in which a black ball can be drawn. Suppose the black is actually drawn from the first bag. It is clear that the draw can be associated with 999 white balls from the second bag.

Now if the drawing shows a black from the second bag there can be associated with it 999 whites from the first.

This gives a total of  $2 \times 999$  ways in which one black can be drawn. There is, in addition, the odd case in which the two blacks can come out at one time. So we get a "black" draw corresponding to forced landings represented by the number  $2 \times 999 + 1 = 1,999$ , or, better for our purpose,  $2 \times 1,000 - 1$ .

The probability of a "black draw" or a forced landing is then

$$\frac{2 \times 1,000 - 1}{1,000 \times 1,000} = \frac{2}{1,000} - \frac{1}{10^6}$$

The deduction of the second fraction  $\frac{1}{10^6}$  makes no practical difference to the result, which is the same as that obtained above, and confirms it.

If, instead of 1,000, we had taken  $n$  hours' flying it is clear

that the probability would have worked out as  $\frac{2n-1}{n^2}$  or,

ignoring the small factor  $\frac{1}{n^2}$ , the probability would be  $\frac{2}{n}$ .

# THE AIRCRAFT ENGINEER

The three-engined machine is in a different category. It is usually, and should always be, designed to fly with any two of its engines running, that is to say, at least two engines must fail before it is compelled to land. The problem then is to determine the probability of the failure of two engines during any particular hour's flying.

The matter appears to be complicated, but it can be simplified by adopting a different method of attack, as follows:—

As representing the three-engined machine we must have three similar bags of balls, and one must be drawn from each bag. Either two blacks or all three must be drawn before a forced landing is indicated. In how many ways then can two blacks be drawn? It is clear that if a black comes out of the first, also out of the second, there can be 999 different white balls drawn from the third; if the blacks come out of the first and third, white can come out of the second in 999 ways, and last, if blacks come out of the second and third, white can come out of the first in 999 ways. The three blacks can be drawn in only one way. The result of this is that at least two blacks can come out in  $3 \times 999 + 1 = 2,998$  ways. This is better written as  $3 \times 1,000 - 2$  ways. Now the total number of ways in which three balls can be drawn (one from each bag) is clearly 1,000 times as many ways as two can be drawn from two bags (each one of the 1,000 can be taken with the  $1,000 \times 1,000$  found previously). Taking the foregoing factors into account, we find the proba-

bility of drawing at least two blacks to be  $\frac{3 \times 1,000 - 2}{1,000^3}$ .

Before leaving the matter it may be of interest to ascertain how different cases work out. That is to say, instead of taking one hour flights, let us take, say, 4, 10 and 25 hours as being the periods over which the reliabilities are required. Take the engines to be of the same class, i.e., giving one failure in 1,000 hours' flying.

Then instead of  $n = 1,000$  we shall have—

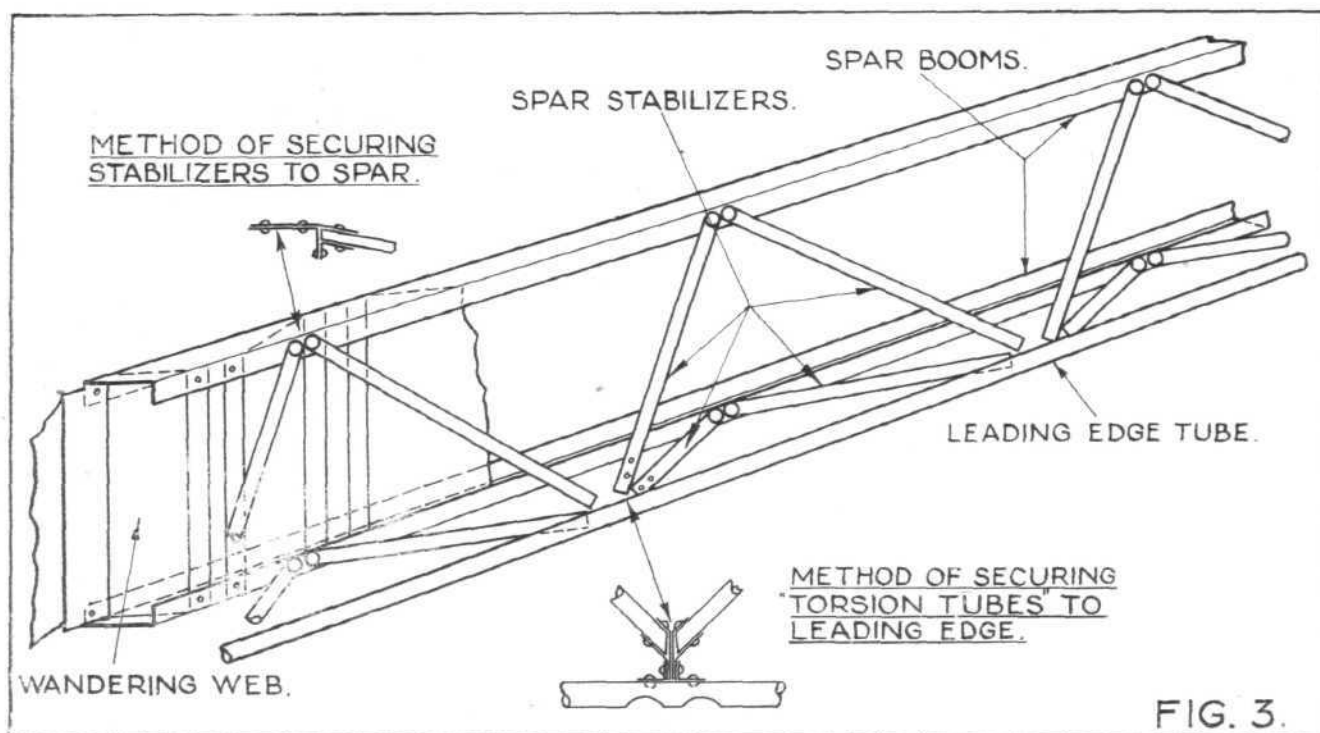
$$\frac{1,000}{4}, \frac{1,000}{10} \text{ and } \frac{1,000}{25} \text{ respectively.}$$

Now if these are used in the formulæ

$$\frac{1}{n}, \frac{2}{n} \text{ and } \frac{3}{n^2},$$

and if we make a table of the results converting the figures to "relative reliabilities," which are the inverse of relative unreliabilities or failures, we arrive at results as follow:—

Duration of Flight in hours.	Number of Engines in Aeroplane.		
	2	1	3
	When the number of engines is as above the relative reliability will be as below.		
1	1	2	666
4	1	2	167
10	1	2	67
25	1	2	27



Now the factor  $\frac{2}{1,000^3}$  is small, so ignoring it we get the probability  $\frac{3}{1,000^2}$ , which works out as approximately  $\frac{1}{333,000}$  as compared with  $\frac{1}{1,000}$  for a single engined and  $\frac{1}{500}$  for a twin-engined machine.

Incidentally, the general formula for the probability of failure in this case is  $\frac{3n - 2}{n^3}$ , or with sufficient accuracy  $\frac{3}{n^2}$ .

On this basis then, a three-engined machine is 333 "times as reliable" as a single-engined machine and 666 "times as reliable" as a twin-engined machine.

If a different basis of calculation is taken, different results will be obtained, but the balance is always in favour of the three-engined machine.

Thus with equal installation, conditions and similar care of each engine, involving more expenditure in tuning up and frequently inspecting vital parts as the number increases, it is seen that from this point of view the three-engined machine is decisively better than that having twin engines.

Returning to the mono-spar wing, another example of this type of construction was on view—the aileron spar of the all-duralumin Vickers "Victoria." This is shown in Fig. 3. The spar is placed at the deepest part of the section, and was stabilised not by tierods, but by a pyramidal system of tubes, the apices of which met at the leading edge.

Light metal construction may have its uses in other branches of engineering, notably in crane work. Two examples of such application were on view, the appliance in each case being for the removal of engines. One of these was on the "Victoria." In this a duralumin beam attachable to brackets on either wing was used as a cantilever to support the lifting blocks. In this neat arrangement the face of the beam along which the blocks move to get the engine clear

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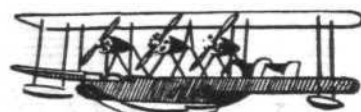
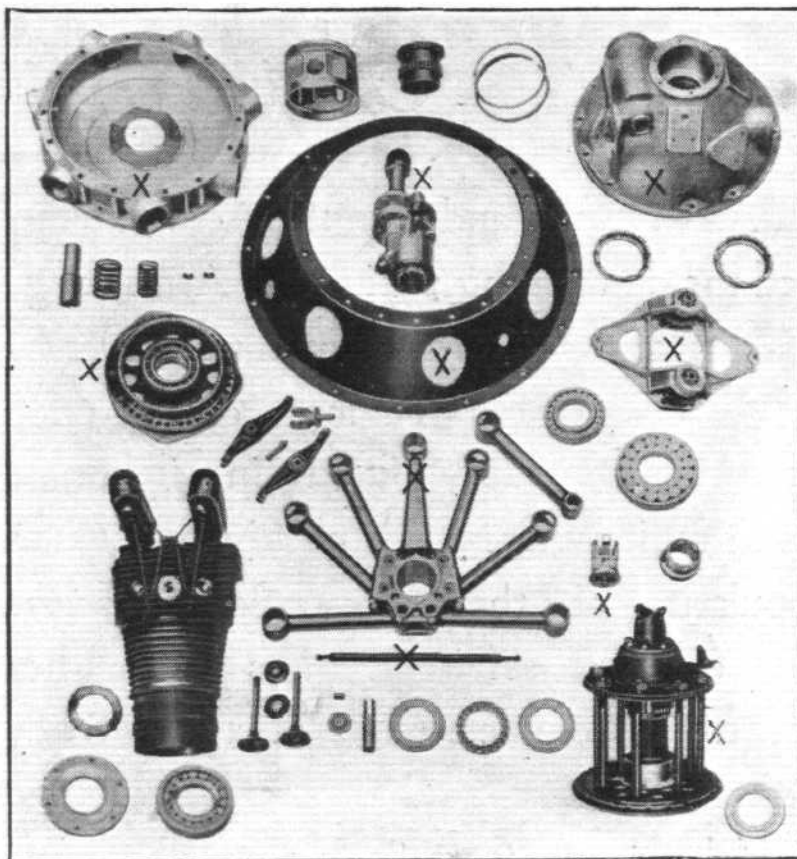
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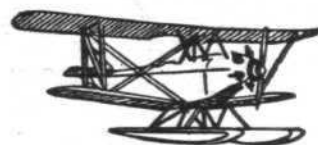
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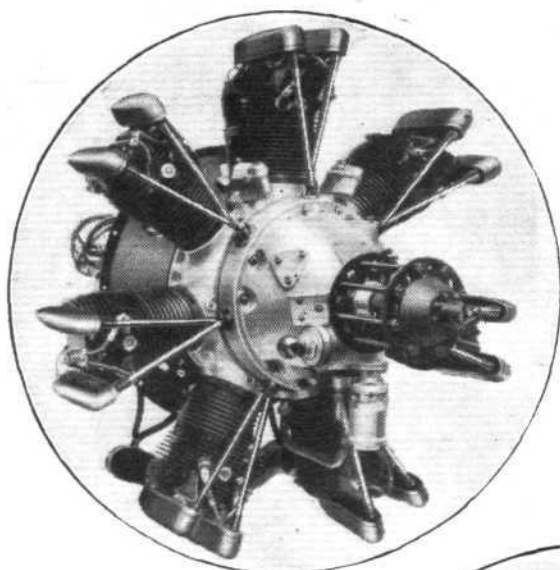


Fokker VII 3M 3 Lynx,  
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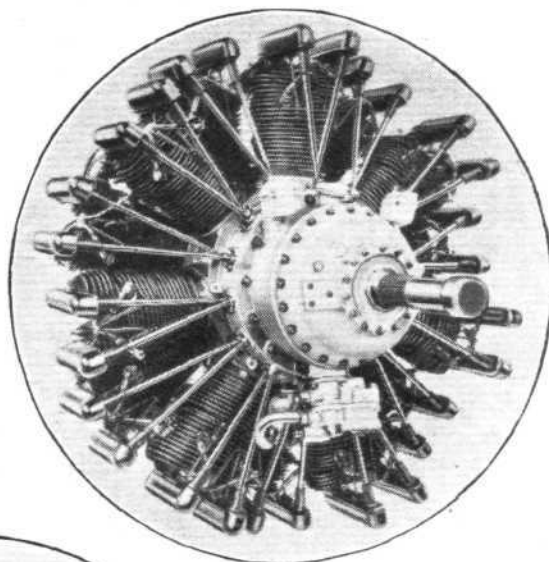
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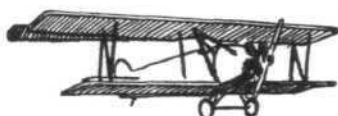
Armstrong Siddeley 7-cylinder  
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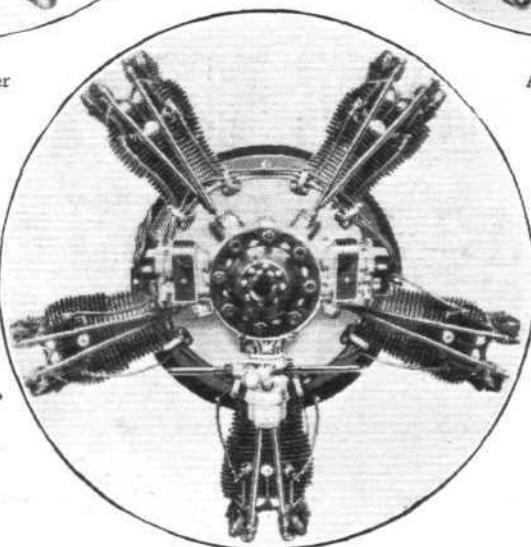
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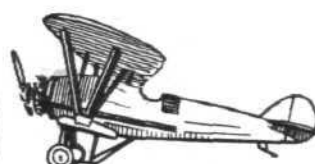
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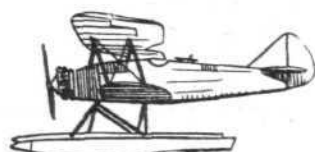
Siskin-Jaguar,  
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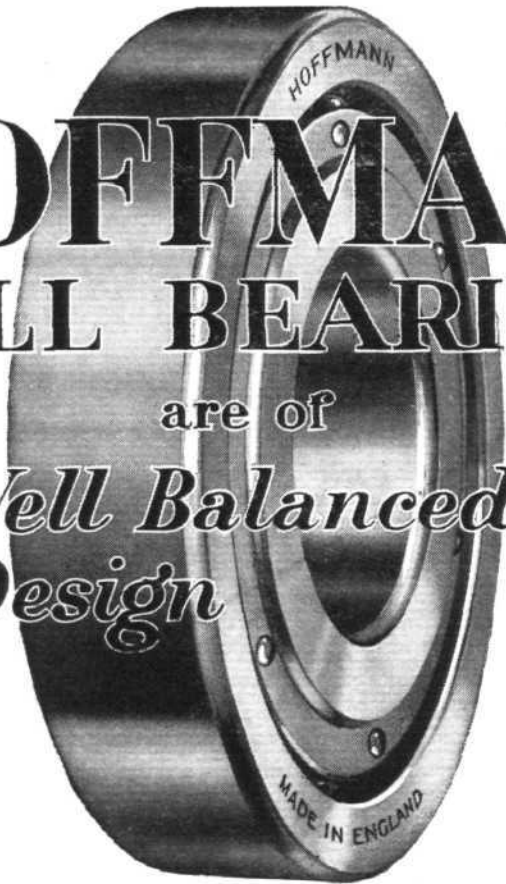
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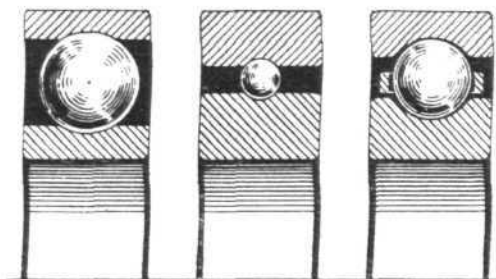
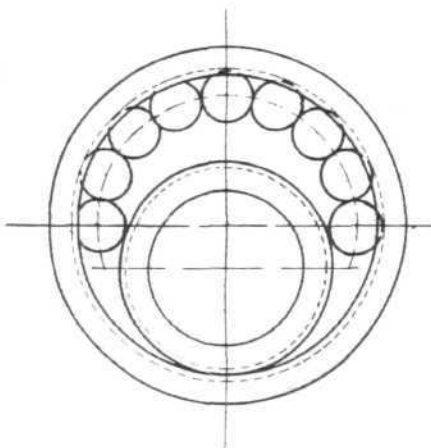
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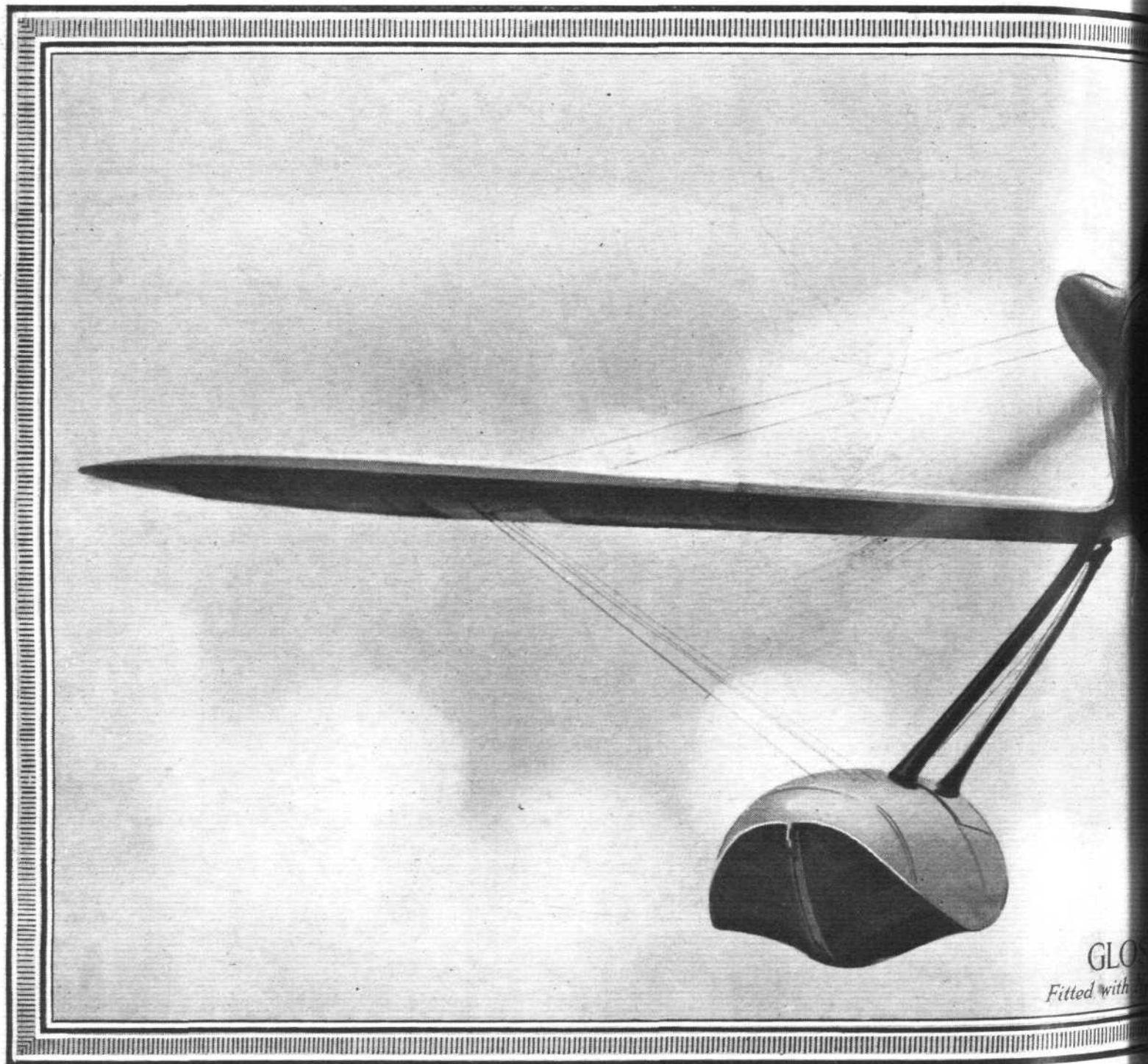


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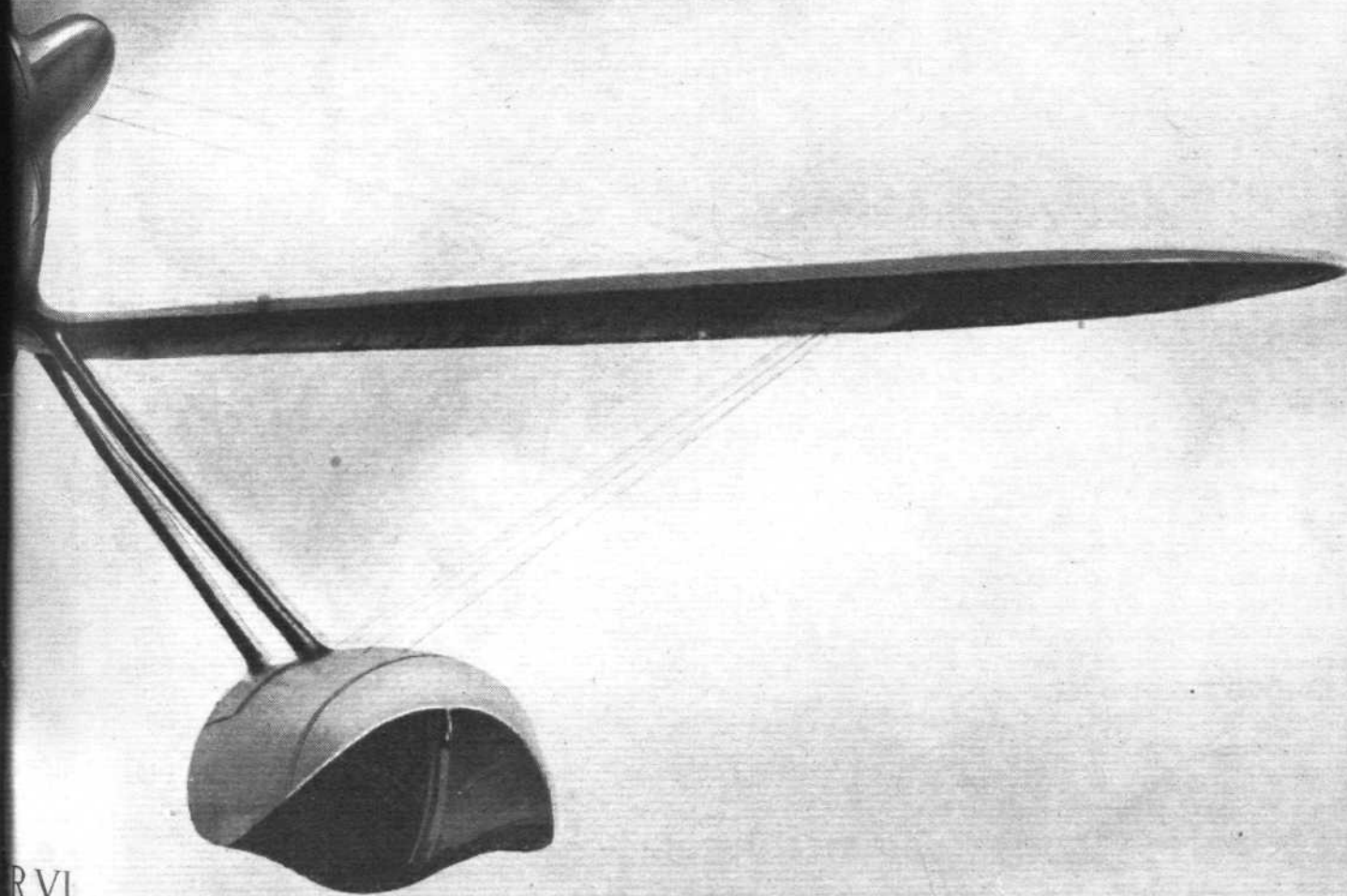
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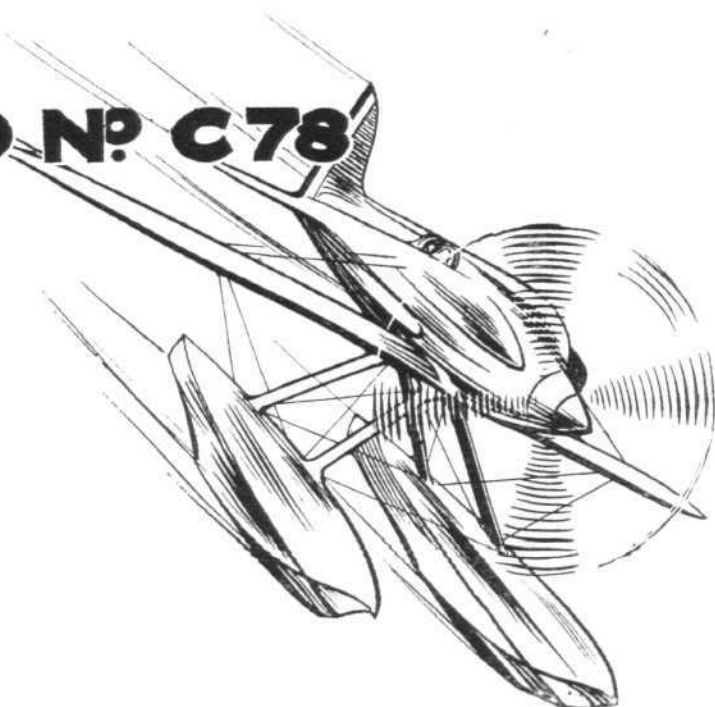
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of the mounting, is horizontal when the tail skid of the machine is on the ground. The other was on the Short "Singapore." In this two shear legs attached to pins held in the bottom wing, and held up by luffing tackle at the apex to the top wing carried the lifting blocks. The slacking out of the luffing gear allows of the rotation of the legs round the bottom anchorage, thus swinging the engine clear of the mounting. For small aircraft probably the best arrangement for effecting the same purpose would be a pulley block suspended from a frame, the frame standing on the ground. This arrangement would require the machine to be moved backwards after the freeing of the engine. The sections used for metal aircraft structures could easily be used for such a frame.

If one is asked what other feature of the Show was worthy of specially favourable comment the obvious answer is "the general excellence of the workmanship," and in apportioning credit for that the influence of the A.I.D. must certainly be acknowledged.

The only adverse criticism was in respect of the body of the Ford—the bunching together and flattening out of the corrugations at the boundaries of the crinkled sides did not meet with general approval, but it is difficult to see how the joints could otherwise be made.

The utility of such an exhibition to the designer depends on how far he is able to work in the impressions gained from it along with his "gift of prophecy" and ingenuity in design to effect further advances and pass a few more "milestones" on the road of progress by the time the next exhibition is due.

#### AN ANALYTICAL REVIEW OF THE ENGINE EXHIBITS AT OLYMPIA.

By N. E. KEARLEY, A.M.I.A.E., A.M.I.E.E.

Owing to the lengthy intervals between the aero shows, it rarely happens that the aircraft engineer or student of aero engine design has such an opportunity as recently presented itself for comparing the products of the various engine manufacturers, for it is only at show time that sufficient data for a comparative survey of modern engines becomes available. For the benefit of those who were unable to visit the Show, or to study the engines as thoroughly as they would have wished, the writer proposes to deal with the material resulting from a careful study of the exhibits, in as instructive and comprehensive a manner as possible. The present article is confined to the more general or superficial observations, but it is intended to probe more deeply into the design and technical aspects in the next instalment.

The Show was disappointing from the engine point of view in one respect only, that is, in the absence of representative American engines. It is true that one make of American engine was at Olympia, namely, the Pratt and Whitney Wasp in the Ford monoplane, but as the present review is limited to those engines which were shown as engine exhibits, the Wasp does not come within the scope of the article.

Two points of great interest are that of the total of 67 engines shown, 38, or approximately 57 per cent., were of foreign design and manufacture, and that these were divided up among the various types in approximately the same proportions as were the British engines. Owing to this similarity between the British and foreign trend of design, it will suffice, for the purpose of analysis, to consider the exhibits as a whole, instead of, in each instance, dealing with them under separate headings. Incidentally, there may be more in this similarity than is at first apparent, for it cannot be said that Continental practice has in any way influenced the British engine designer; may it not, therefore, be logically concluded that "what England does to-day, the Continent does to-morrow," with respect to aero engines? One uses "England" intentionally, in preference to "Great Britain" for, excluding the products of Messrs. Wm. Beardmore and Co., who, unfortunately, were not represented at Olympia, one has never heard of a British aero engine that was not "made in England," excluding, of course, those built under licence abroad.

The struggle between the air and water-cooled types continues as fiercely as ever, although there are definite signs that the star of the water-cooled type is on the wane, if, indeed, it has not been so for some little while past. The division of the exhibits among these two main types is, air-cooled 60 per cent. and water-cooled 40 per cent., the latter being in the proportions of 38 per cent. and 42 per cent., respectively, when considered separately as British and foreign engines.

The air-cooled type therefore appears to be enjoying a slightly greater popularity among British designers, if the Show statistics may be taken as forming a reliable guide to the current practice, both here and abroad. In this connection, it should be noted that the figures have not been unduly "weighted" (as the Insurance people say) by a preponderance of the exhibits of any one specializing firm which might turn the scale in favour of one type or the other. The apparently greater vogue of the air-cooled type in this country may, however, be considered as being due to the popularity, for obvious reasons, of the air-cooled light 'plane engine, in which class no less than five British firms were represented. When it is remembered that the total number of British engine firms exhibiting was only 11, it will be seen that, judging by the proportion of purely civilian or peace engine builders, the Show was considerably less military than would be imagined from a review of the aircraft exhibits only.

In addition to the five light 'plane engine firms, one other firm showed engines of both the water and air-cooled types which, although in the medium-power class, were intended for civil use. Furthermore, whilst it is in most cases impossible to convert into a war machine (other than a troop carrier) an aeroplane built for civil employment, most of the larger engines, produced under the eye of the Air Ministry, primarily for military duties, may be used in civil aircraft almost without modification. There were, in fact, very few engines at Olympia built exclusively for use in fighting aircraft, these few being of the ground-throttled, high-compression ratio or supercharged type designed for installation in high-altitude aircraft.

The balance between the air- and water-cooled types has been particularly well adjusted by a wise Air Ministry among the British "Big Four"—namely, Armstrong-Siddeley, Bristol, Napier, and Rolls-Royce; and, as stated, if it had not been for the large number of light 'plane engines, the honours would have been very evenly divided.

Among the foreign exhibitors, it may be observed that a number of the larger firms—notably Farman, Fiat, Isotta-Fraschini, Lorraine, and Renault—were showing engines of both the air- and water-cooled types, although as a pointer it should be noted that in each case the air-cooled engines were more or less of an experimental nature, produced by firms whose reputations have been built up by their water-cooled engines, with the possible exception of Renault. In fairness to the water-cooled type, however, it should be remembered that in the majority of cases these new foreign air-cooled engines have not been produced to compete in the same class as the water-cooled engines built by the parent firms, the new types having in most cases considerably lower output. On the other hand, there appears to be no recent case of a firm which had hitherto specialised in air-cooled engines turning its attention to the other type, although this was done by Renault many years ago. It is of interest to record that only one British exhibitor—A.D.C. Aircraft, Ltd.—showed engines of both types, namely, the "Nimbus" and the "Airsix." Before leaving the question of cooling it may be mentioned that it was disappointing to find that nothing was to be seen regarding the employment of any of the alternative means which are at present undergoing development both at home and abroad, and which may, perhaps, give the jacketed engine a still further lease of life.

In subdividing the two main types into their separate classes the exhibits have been treated as a whole, owing, as previously stated, to the similar proportioning of each class in the British and foreign engines. In the air-cooled type the radial, of course, predominates, although this superiority is not so marked in the case of the water-cooled V-type, which is still the most popular type in the rival camp.

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The engines are divided in the following proportions:—

Air-cooled.		Water-cooled.	
	Per cent.		Per cent.
Radial ...	67.5	Vee ...	59.4
In line* ...	17.5	Broad arrow* ...	29.6
Horizontal opposed ...	7.5	In line ...	11.0
Axial ...	5.0		
Vee ...	2.5		

\* One inverted.

The next instalment will go further into the design characteristics of the above types, and some interesting comparative figures will be produced.

(To be continued.)

## IN THE DRAWING OFFICE.

### RAPID PLOTTING OF ELLIPTIC FUSELAGE SECTIONS.

By R. RODGER

The method of plotting elliptic fuselage sections described by Mr. I. E. James in the July issue of THE AIRCRAFT ENGINEER seems to be a little too laborious as a routine operation. At one time the writer himself employed the construction put forward by Mr. James, but scrapped same about two years ago in favour of the bi-sweep method of elliptical construction, described hereafter, which is much easier to apply and very satisfactory in practice.

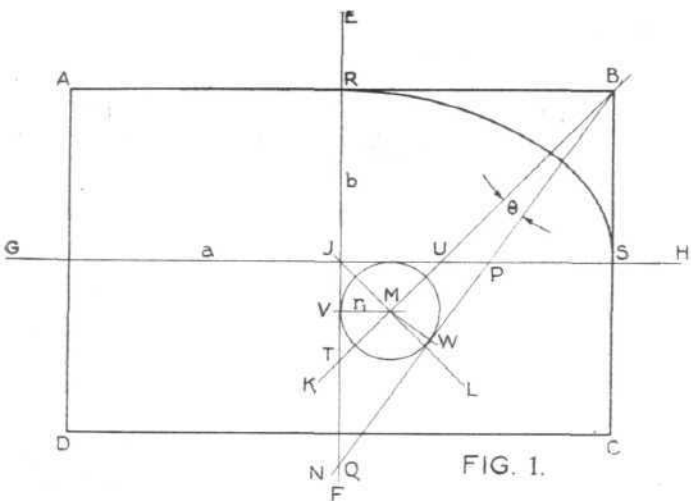


Fig. 1 shows the geometry involved. Draw the rectangle ABCD making AB = CD = major axis of required ellipse and AD = BC = minor axis of required ellipse. Draw the centre lines EF and GH intersecting in J. From B draw BK so that angle ABK = 45°. From J draw JL so that angle FJL = 45°, and intersecting BK in M. With M as centre draw a circle tangent to JH and JF. From B draw BN tangent to the circle just drawn and intersecting JH in P and JF in Q. The radii for constructing the ellipse are now PS and QR.

Dealing now with the trigonometry of the construction by reference to the same figure. Line BK intersects centre line EF in T. In triangle BRT, angle RBT = 45°, by construction,

$$\begin{aligned} \therefore RT &= RB = \frac{1}{2} \text{ major axis} = a \\ \text{and } JT &= RT - RJ \\ \text{but } RJ &= \frac{1}{2} \text{ minor axis} = b. \\ \text{Hence } JT &= a - b. \end{aligned}$$

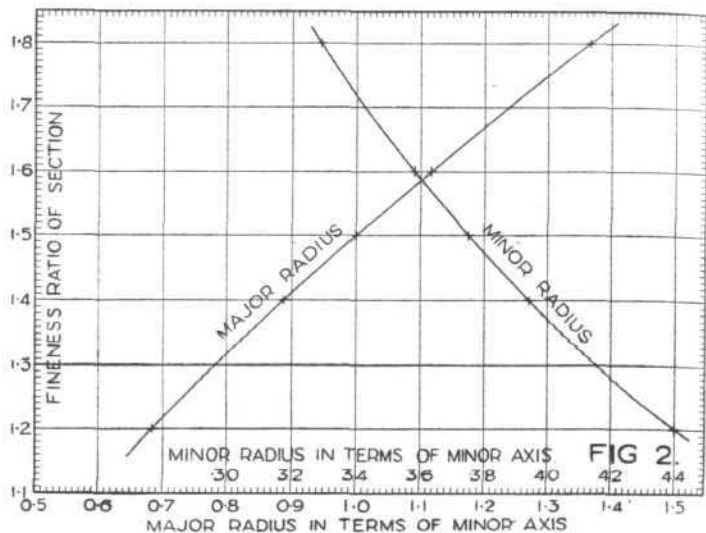
Line BK intersects centre line GH in U. Triangles BRT and UJT are similar and are isosceles. From M drop a perpendicular on to EF with intersection at V. Now, as angle JMT is a right angle,

$$\begin{aligned} MV &= JV = \frac{1}{2} JT = \frac{1}{2} (a - b) \\ &= \text{radius of circle} = r_1 \end{aligned}$$

In triangle BRT,  $BT = 1.414 BR = 1.414 a$ , and in triangle MVT,  $MT = 1.414 MV = 1.414 r_1$ .

$$\begin{aligned} \therefore BM &= 1.414 (a - r_1) \\ &= 0.707 (a + b). \end{aligned}$$

From M drop a perpendicular on to BN with intersection at W. In triangle BWM,



$$BM = 0.707 (a + b)$$

and

$$WM = 0.50 (a - b).$$

$$\therefore \sin MBW = \frac{0.50 (a - b)}{0.707 (a + b)} \quad \dots \dots \dots (1)$$

Call this angle  $\theta$ .

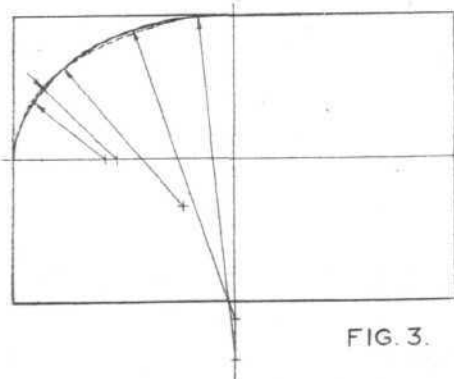
In triangle BRQ,

$$\begin{aligned} BR &= a = \frac{1}{2} \text{ major axis.} \\ RQ &= R = \text{major radius.} \\ \text{Angle RBQ} &= (45 + \theta)^\circ. \\ \therefore R &= a \tan (45 + \theta) \quad \dots \dots \dots (2) \end{aligned}$$

In triangle BSP,

$$\begin{aligned} BS &= b = \frac{1}{2} \text{ minor axis.} \\ SP &= r = \text{minor radius.} \\ \text{Angle SBP} &= (45 - \theta)^\circ. \\ \therefore r &= b \tan (45 - \theta) \quad \dots \dots \dots (3) \end{aligned}$$

Examination of these formulæ will show that the major and minor radii may be expressed in terms of the minor axis and plotted as two simple curves against fineness ratio as per Fig. 2. Hence, to plot an ellipse to any given pair of axes it is only necessary to obtain the fineness ratio by simple division, when the two required radii may be read off the curves directly in terms of the known minor axis.



In Fig. 3 the two methods are compared on a common pair of axes. The full ellipse is obtained from the geometrical construction described by Mr. James, the three required radii being shown in full lines. The dotted ellipse is constructed according to the bi-sweep method described above, Fig. 2 being employed to determine the two required radii shown in chain lines.

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SUMMARIES OF AERONAUTICAL RESEARCH  
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**THE STRENGTH OF TUBULAR STRUTS.** By Prof. Andrew Robertson, D.Sc. R. & M. No. 1185 (M. 58). (23 pages and 40 diagrams.) July, 1927. Price 2s. 6d. net.

The problem of the strength of a circular tubular strut differs from that of a solid strut of the same material in that there may be a condition of instability in the wall of the tube, apart altogether from that type of instability considered in the Eulerian analysis, which involves only the bending of the centre line of the strut. It is found that when a thin tube is tested in direct compression up to collapse it fails by the formation of characteristic folds in the wall and the folds are of two types, depending upon the ratio of the thickness to the radius of the tube. Above a certain value of this ratio, the fold consists of a uniform bulge, in which all cross sections remain circular; below this value, the walls "cave in" in several places, producing a series of lobes. The phenomenon has been called wrinkling, and also secondary flexure to distinguish it from the instability produced by the bending of the centre line of the strut.

The report mentions the theoretical papers of other workers on the same subject, and compares his experimental results therewith. The author arrives at the conclusion that a reasonable estimate of the strength of a steel tubular strut can be made by using the eccentricity formula (Prof. Smith), or the modification by Prof. Perry, and inserting as the stress term the lower of two values, i.e., the yield or an appropriate fraction of the Southwell value for collapse by elastic instability. In order, therefore, to avoid elastic instability as a primary cause of failure, the value of the ratio for steel tubes should be greater than 0.4 ps., i.e., 0.006 for mild steel (20 tons yield). It is hardly likely that tubes of such a character will be used in ordinary engineering work, but this investigation has an important bearing upon the design of metal construction for aircraft. In this work, one of the important elements of design is to avoid failure by elastic instability when compression stresses have to be taken. In order to do this, flat surfaces are avoided, and the flanges of girders, etc., are made curved or indented.

The following is a summary of the conclusions:—

1. For tubular struts of mild steel having a yield in compression of 22 tons per sq. in., the strength depends on the yield stress, and not on the wrinkling stress provided the ratio of thickness to radius is greater than 0.022.

2. For short specimens of thin tubes tested in compression failure will occur either at the yield or at a stress which is some fraction of the Southwell value (ps) for the load required to produce elastic instability in the walls. For the tubes tested the fraction varied from 0.4 for solid-drawn small tubes of mild steel and nickel chrome steel to 0.6 for tubes made from the steel strip used in metal construction of aircraft. The value of this fraction doubtless depends upon the accuracy of the tubes, and even with perfect tubes would be less than unity on account of the additional stresses introduced in applying the load. In all cases of thin tubes, the wave length of a deformation is small, being considerably less than the radius of the tube.

3. For tubes having a ratio greater than the value as determined by 2 above, the proportional elastic limit, and also yield, where this is well defined, precedes wrinkling, and the particular type of deformation produced depends upon the ratio.

**AN INVESTIGATION OF FLUID FLOW IN TWO DIMENSIONS.** By A. Thom, B.Sc., Ph.D., A.R.T.C. Communicated by Professor J. D. Cormack, C.M.G., C.B.E., D.Sc., M.Inst.C.E. R. & M. No. 1194 (Ae. 356). (18 pages and 10 diagrams.) November 1928. Price 1s. net.

The report commences with a solution of the simpler problem of the two-dimensional flow of a perfect fluid for given boundary conditions, and continues by describing a method of obtaining a numerical solution of viscous steady flow. The same method used in an earlier paper by Dr. Thom is adopted, taking a square in the fluid,\* and after extending in Taylor's theorem, neglecting the third-order quantities. The author has shown that within certain limits his method of approximation is convergent. The solution was studied by assuming the field obtained by calculating the values from the expressions for the flow of an inviscid fluid past a cylinder of radius 20 per cent. greater than the actual cylinder to allow for the retardation over the surface.

The experimental determination of the pressures round a stationary cylinder in an air current was made throughout a large range of Reynolds numbers. A fairly good agreement is obtained between theory and experiment. Consideration is also paid to the effect of the channel walls on the flow past the cylinder.

\* A method similar to that used by L. F. G. Richardson for solving the first-order differential equations in the case of a concrete dam.

**A MECHANICAL METHOD FOR SOLVING PROBLEMS OF FLOW IN COMPRESSIBLE FLUIDS.\*** By G. I. Taylor, F.R.S. and C. F. Sharman, Ph.D. R. & M. No. 1195. (22 pages and 11 diagrams.) August, 1928. Price 1s. net.

At the present time, the chief study of aerodynamical laboratories is concerned with the steady flow of air past solid bodies at speeds which are so low that the effect of compressibility is inappreciable. In recent years, however, the rapid increase in the speed of aircraft has much increased the importance of the study of the effect of compressibility on air flow. As an example, the tips of the propellers of high-speed machines may move at speeds as high as 1.3 times the speed of sound.

In the present report, a method is described by which it is possible, without

very great labour, to find the flow of a compressible fluid past an obstacle of any shape, provided that irrotational motion is possible. The first application of this method has been to Rayleigh's case of the circular cylinder. In this case the method produces, mechanically, successive approximations which are practically identical with those which would result from successive applications of Rayleigh's mathematical method. One of the most important results of the present work is the discovery that the failure of convergence occurs not when the speed of the main body of the stream reaches that of sound, but at some lower speed. In the case of a circular cylinder, convergence fails when the maximum velocity in the field reaches the speed of sound in the air at that point. This first occurs when the speed of the stream is between 0.4 and 0.5 of that of sound. At a speed of 0.5 of that of sound it appears that no continuous irrotational motion is possible past a circular cylinder.

The method is dependent on an electrical analogy with the equations of hydrodynamic flow, and uses a tank the depth of the electrolyte in which can be varied. An alternating current is passed between the model and the sides of the tank. Successive approximations to the form of the bottom of the tank give values of the density. Some results are given in the present paper, and others will be found in R. & M. 1196.

\* Previously published by The Royal Society, Series A, Vol. 121.

**WING FLUTTER EXPERIMENTS UPON A MODEL OF A SINGLE-SEATER BIPLANE.** By W. G. A. PERRING, R.N.C. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1197 (Ae. 358). (20 pages and 10 diagrams.) November, 1928. Price 1s. 3d.

Several cases of wing flutter have occurred in aeroplanes, and an attempt has been made, with considerable success, to develop a satisfactory theory of wing flutter for a monoplane wing.\* This theory has been extended to include certain possible flutter conditions that may occur in a biplane structure. The present experiments were undertaken to investigate the possibilities of determining the critical speeds of flutter and the type of flutter of an aeroplane wing structure, from tests on a scale model of reduced rigidity.

A model was constructed representing to one-third scale the port wing structure of a single-seater biplane. Full scale and model tests were made to check the flexural and torsional stiffness of both the upper and lower planes separately, and of the complete wing unit.

Wind-tunnel tests were carried out to find the wind speed at which flutter occurred, and the general type of flutter:—

- (a) with the model centre section clamped rigidly to the floor of the tunnel; and
- (b) with the model free to roll.

In both cases, tests were made with aileron control cables free, and also with the aileron control column locked. The flutter was also cinematographed.

The model experiments indicate that flutter might start at a speed as low as 130 m.p.h. if the control cables were slack and demonstrate the possibilities of reproducing and investigating the flutter of any aeroplane wing system by testing models of reduced rigidity in a wind tunnel. There is some full-scale evidence of slight flutter at speeds near 140 m.p.h.

In spite of the present rather incomplete representation of the full-scale conditions, the model flutter speed and frequency found for the tests that most closely correspond to the full scale are in good agreement with available full-scale results. The damping in the aileron system has a very considerable influence on the flutter speed, large damping delaying the flutter to a higher speed and causing it to be much more violent. The experiments emphasise the importance of having no slack in the control system. Wing flutter on the model has only been found to occur under conditions which represent a fuselage whose inertia is large compared with that of the wing structure or a fuselage subject to equal and opposite forces by the wings.

\* R. & M. 1155. "The flutter of aeroplane wings."—Frazer and Duncan.

**REPORT ON THE STIFFNESS OF CRANKSHAFTS.** By H. Constant, B.A. R. & M. No. 1201 (E. 29). (16 pages and 9 diagrams.) October, 1928. Price 1s. net.

The investigations described in this report were carried out at Cambridge, by the author, for the Torsional Vibration of Crankshafts Panel of the Aeronautical Research Committee in connection with the first of their terms of reference, viz., "to evolve methods for calculating, from engineering drawings, the rigidity of a crankshaft." The report has been endorsed by the Panel, and is now published as one of a series relating to the Panel's work. Other reports already issued in connection with the general terms of reference are:—

- (i) The equivalence between the dynamical system of a multi-crank fly-wheel system and a certain electrical circuit, with some suggestions for measuring critical speeds and shaft stresses by analogy.—E. B. Moulin, M.A. R. & M. 1045.
- (ii) Torsional Vibration in Engines. Effects of fitting a damper, a flywheel, or a crankshaft driven Supercharger.—B. C. Carter, D.I.C., M.I.Mech.E. R. & M. 1053.

The torsional resonance speed of an engine depends upon the magnitude, and distribution of its rotating and reciprocating masses and upon the effective torsional stiffness of its crankshaft. This report is concerned only with the questions of stiffness involved, and not with methods of idealising the mass system so as to allow of a mathematical analysis of the dynamical problem.

From time to time, a number of formulae for the static stiffness of a crankshaft in bearings have been put forward. These have either been derived from purely theoretical considerations, or have been developed empirically on the results of static torsion tests. So far, the best results have been given by an empirical formula due to Major B. C. Carter.\*

An attempt is here made to develop a formula which, while it is based on the results of torsion tests, yet gives an insight into the factors affecting the stiffness of a shaft and the distribution of stress therein.

A number of crankshafts were subjected to static torsional tests out of bearings. From the results of these tests, a rational formula for the stiffness of a crankshaft out of bearings was devised. Next, from the results of torsion tests on crankshafts in their crankcases, the ratio of stiffness in bearings to stiffness out of bearings was obtained. The conditions affecting this stiffening ratio were then investigated, and a formula giving this ratio in terms of crankshaft dimensions was developed. The stiffening ratio was then combined with the out of bearings stiffness to give a formula for the stiffness of a crankshaft in its crankcase. Finally, the application of this formula to the determination of torsional resonance speeds was briefly considered.

\* Engineering, July 13th, 1928.

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**WIND-TUNNEL TESTS OF AEROFOILS WITH PILOT PLANES.** By F. B. Bradfield, Math. and Nat. Sci. Triposes, and K. W. Clark, B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1213 (Ae. 372). (26 pages and 10 diagrams.) November, 1928. Price 1s. 3d. net.

The "pilot plane" is an auxiliary aerofoil pivoted ahead of a wing so as to provide automatically a slotted wing at high incidence without much increase of drag at fine angles. This report continues an investigation into the use of pilot planes with wings of sections R.A.F. 28, 30, 31, 35 and 36. The following is a brief summary of the results:—

1. With a pilot plane of chord 0.15 c. the following values of maximum lift coefficient were found:—

Section.	R.A.F. 30.	31	35	36
$k_L$ max.	0.83	0.94	0.90	0.95

R.A.F. 28 section with a 10 per cent. pilot plane had a maximum lift coefficient of 0.72.

2. The additional drag due to the pilot plane is 60 per cent. of the minimum drag of the pilot plane as tested alone, so long as  $k_L$  is less than 0.25.

3. The maximum lift coefficient of R.A.F. 15 with a 6 per cent. pilot plane in front of a 9 per cent. pilot plane is 0.97.

4. The following maximum lift coefficients were found for a R.A.F. 36 wing with a pilot plane and flap:—

Flap Angle.	Flap Slot.	$k_L$
0°	Closed	0.95
0°	Open	1.01
15°	Open	1.25

5. The increase in drag coefficient due to the slot with flap at 0° is 0.0013 at  $k_L = 0.12$  on a R.A.F. 36 wing.

Reference should also be made to R. & M. Nos. 1117 and 1145.\*

\* R. & M. 1117. Scale effect on three aerofoils at low values of  $LV$ . R.A.F. 32, Göttingen 433 and Göttingen 410 with 2 per cent. centre line camber.—F. B. Bradfield. (This gives scale effect on the pilot planes used in other tests.)

R. & M. 1145. Wind-tunnel tests on a R.A.F. 15 aerofoil with pilot planes.—F. B. Bradfield and K. W. Clark.

**THE LIFT AND PITCHING MOMENT OF AN AEROFOIL DUE TO A UNIFORM ANGULAR VELOCITY OF PITCH.** By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1216 (Ae. 375). (9 pages and 4 diagrams.) November, 1928. Price 9d. net.

Hitherto, little attention has been paid to the pitching moment of a wing, due to pitching, since this moment is small, compared with the corresponding moment due to the tailplane, and is therefore relatively unimportant in calculations relating to the stability of an aeroplane. More recently, however it has appeared that this pitching moment is one of the factors which affect the tendency of a wing to flutter. An attempt has therefore been made to calculate, theoretically, the force on an aerofoil, due to a steady angular velocity of pitch.

The analysis has been confined to the condition of uniform angular velocity, the additional effects of an oscillating motion being deferred for subsequent examination. The analysis provides theoretical estimates of the lift and pitching moment of an aerofoil section in two dimensional motion, and of a rectangular aerofoil of any aspect ratio.

The lift and pitching moment due to pitching are shown to be independent of the angle of incidence, but to vary rapidly with the position of the centre of rotation.

Experiments are to be made with special reference to the position of the centre of rotation as a check on the theory. It is proposed also to extend the theoretical investigation to the more complex problem of an oscillating wing.

**INVESTIGATION INTO THE PROPOSED USE OF A SAND CAST TEST BAR FOR SPECIFICATION PURPOSES FOR ALUMINIUM ALLOYS.** By W. Rosenhain, D.Sc., F.R.S., and S. L. Archbutt, F.I.C. Work Performed for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1219 (M. 59). (9 pages.) January, 1929. Price 6d. net.

Chill cast test bars have hitherto been generally used in this country for specification purposes for light alloy castings, mainly on the ground that they furnish a satisfactory indication of the quality of the metal of each cast, and because they are comparatively easy to prepare in a sufficiently standardised and reproducible form.

Recent investigations have, however, shown that the soundness, density and strength of actual castings—particularly sand castings—is dependent upon their freedom from gas, the presence of which also leads to "speckling," or "pinholing" on machined surfaces. It has, however, been found that there is a strong tendency for most of the indications of this defect to be suppressed, owing to the relatively rapid rate of solidification, in small chill castings such as the standard 1-in. diameter test bars.

A series of sand cast test bars have been prepared in sand moulds of special and simple type, using Y-alloy of widely-varying gas content. Density, machining, and tensile tests have been made on them, and comparison has been made with chill cast bars prepared from the same melts. The presence or absence of gas is clearly indicated in the test results from the sand cast bars, whilst relatively little effect is seen in corresponding tests on chill cast bars. The advantage of the sand cast test bar from this point of view is thus clearly demonstrated.

So far as they go, also, the present series of tests indicate that the results are reproducible. Before this can be more generally affirmed, however, a more extensive series of tests carried out with the collaboration of aluminium foundries, and on a range of typical alloys, will be necessary. Data will thus be furnished with a view ultimately to the laying down of a standard specification by the British Engineering Standards Association.

**THE EFFECT OF STRESS UPON THE X-RAY REFLECTIONS FROM TUNGSTEN WIRE AT AIR TEMPERATURE.** By H. L.

Cox, B.A., and I. Backhurst, M.Sc. Work performed for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1221 (M. 61). (4 pages and 1 diagram.) January, 1929. Price 9d. net.

As a result of a theory of the polyphasic nature of single crystals, it has been suggested that, provided the elastic range was not exceeded, the stressing of such crystals would be accompanied by a blurring of the X-ray reflections and that such blurring would disappear upon removal of the load.

In order to test this conclusion it was proposed to X-ray a single crystal, first unstrained, then under load and then again unstrained, and to compare the photographs obtained. Should the second photograph in comparison with the first show a blurring of the spots, which was absent or less marked in the third, then this would constitute the result predicted; but, should the blurring of the spots in the second photograph be reproduced exactly in the third, then it must be inferred that the expected effect either did not occur or was too slight to be detected.

Laué diagrams were taken of a single crystal tungsten wire while subjected to various normal tensile stresses from 2 to 104 tons per sq. in. The photographs taken at stresses within the elastic range were compared visually and analytically both as regards appearance and orientation of the spots and any differences between successive photographs were noted, the corresponding changes of orientation of the crystal being deduced.

The present experiment has failed to demonstrate the existence of the effect anticipated, and it appears that the range of stress yet unexplored (88 to 97 tons per sq. in.) within which, by a repetition of the experiment, the suggested effect might still be observed, is so narrow that further work on these lines is not justified.

**WIND-TUNNEL TESTS OF A R.A.F. 30-WING FITTED WITH A SELF-SETTING SLOTTED WING (PILOT) PLANE.**—By F. B. Bradfield, Math. & Nat. Sci. Triposes, and S. Scott Hall, M.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1225 (Ae. 380). (12 pages and 5 diagrams.) May, 1927. Price 9d. net.

In view of the mechanical difficulties and weight of suitable gear for the operation of efficient slotted wings, it is proposed to develop a self-operating type of auxiliary ("pilot plane"), which is free to set itself at high speeds along the path of the relative wind in its minimum drag position, but is constrained by suitable stops at low speed, so that a high maximum lift is given to the wing arrangement as a whole.

The free positions of the pilot plane were measured with zero weight moment; its hinge moments were also measured so that its position for any actual weight moment may be calculated. Lift and drag were measured, using various positions of the flap with which the main aerofoil is fitted.

The drag tests show that the increase in minimum drag due to the pilot plane is equal to the profile drag of the pilot plane as tested alone, but that the extra drag increases rapidly with increasing incidence. The maximum lift coefficient is increased from 0.42 to 0.67 (at  $LV = 40$ ) by the pilot plane, and further to 0.84 by means of a flap depressed 20°.

Further tests will be made, using different pilot planes. A Bristol Fighter, with R.A.F. 30 section wings, is being fitted with pilot planes in front of the ailerons, and will be tested. It is proposed to extend pilot plane tests to other wing sections, such as R.A.F. 31 and R.A.F. 15.

**THE SKIN FRICTION ON A CIRCULAR CYLINDER.** By A. Fage, A.R.C.Sc. R. & M. No. 1231 (Ae. 382). (9 pages and 4 diagrams.) February, 1929. Price 9d. net.

The skin friction on a circular cylinder has been estimated from the experimental data given in R. & M. 1179.\* A comparison of the experimental value of the intensity of skin friction on the surface with theoretical values predicted from an expression due to Dr. Thom† indicates that, over the range of  $(VD/\nu)$  covered, the flow in the boundary layer is laminar almost up to the breakaway region. The intensity of skin friction on the cylinder differs considerably from that on a flat plate.

\* R. & M. 1179. The airflow around a circular cylinder in the region where the boundary layer separates from the surface.—By A. Fage.

† R. & M. 1176. The boundary layer of the front portion of a cylinder.—A. Thom.

**THE CONTROL OF THE FOKKER F. VII—3M. AEROPLANE.** Interim Report by the Stability and Control Panel, with an Appendix giving Précis of Pilots' Reports. R. & M. No. 1236 (Ae. 391). (5 pages.) March, 1927. Price 4d. net.

The characteristics of this aeroplane in flight have been examined by a number of experienced pilots. Wind-tunnel experiments have also been made upon the action of the ailerons and upon the moments which act upon the wing when rolling and sideslipping at normal incidences and when stalled. Quantitative experiments to record the actual motions of the aeroplane in flight are given in an appendix.

In normal flight, the Fokker illustrates the value of approximately neutral stability coupled with well-balanced control, and the value of taper wings in relation to light aileron control, whilst in stalled flight, the Fokker suggests a possible value of high lift wings arising from the increased warning which they give of an impending stall.

In respect of danger following a stall, a Fokker is no better than other machines but the probability of the stall occurring may be less.

**ON THE TWO-DIMENSIONAL FLOW PAST A BODY OF SYMMETRICAL CROSS-SECTION MOUNTED IN A CHANNEL OF FINITE BREADTH.** By A. Fage, A.R.C.Sc. R. & M. No. 1223 (Ae. 378). (12 pages.) February, 1929. Price 9d. net.

A simple method for predicting the effect of channel walls on the drag of a symmetrical section of good aerodynamical shape is given in the paper. The prediction involves two factors, of which the first is dependent on the size of the section and the breadth of the channel, and the second is related principally to the shape of the section. The method rests on an empirical basis, but use is made of theoretical relations derived from Rankine ovals in an inviscid fluid.



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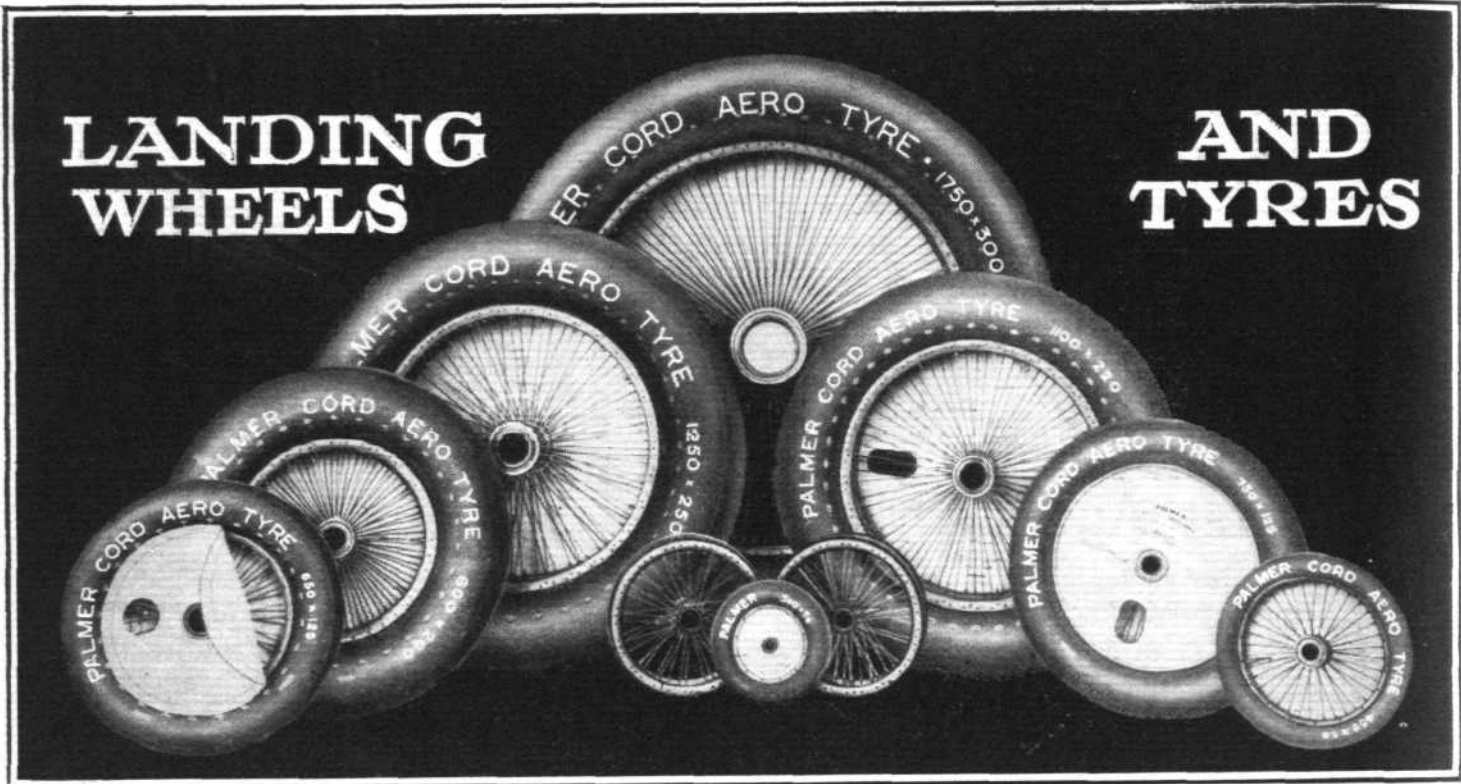
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# SCHNEIDER TROPHY TRAINING

By MAJOR F. A. de V. ROBERTSON, V.D.

Wednesday, August 21.—We have had an exciting day at Calshot. I briefly reported in my last that Atcherley made his second flight on the Supermarine Rolls Royce this morning at 11.25 a.m. The order in which the pilots have been going up has interested me. Some one said that there was a rota, but this is obviously not the case. Atcherley had two flights running on the S.6, and neither of the Flight-Lieutenants has yet been up in it. Now there are two new types and five pilots. The ideal thing to do, if there were plenty of time, would seem to be for each of the five to be tried out thoroughly on each type, and then to decide which man was best fitted to which type.

Orlebar is evidently not working on that system, and he would not have time to put it through if he were to attempt it. He appears to have allotted the Supermarine Rolls Royce to the two Flying Officers, and to be reserving the Gloster Napier for the two senior officers. Doubtless he has studied both designs with the Air Ministry experts, as well as with the designers, and he probably has some very good reason for his policy.

I think it may be concluded that he considered that Atcherley needed a second practice flight before Waghorn went up again. But Atcherley did not have very good luck on this occasion. A new airscrew was tried on the machine. There was an almost entire absence of wind, and the sea was very nearly glassy this morning. Still, once he had chosen his position, Atcherley got off with a shorter run than I have yet seen this machine make. He flew with more confidence than on his first attempt, as was to be expected. In one turn he went into a very nearly vertical bank, but climbed a bit in doing so. Then the engine began to miss a trifle, and after six minutes in the air Atcherley landed quite well. The S.6 lands very slowly for a racer, and pulls up very quickly.

It was found that there was some slight carburation trouble, which was quickly righted, and by the afternoon the machine was again ready for the air.

## A Remarkable Flight by Waghorn

At 3.30 Waghorn took off on his second flight in the S.6. He started with a rather long run, but it was quite a model of flying a seaplane off the water. He circled round a few times to warm his engine, which was evidently in fine fettle, and then began to open his throttle. Starting somewhere to the west of Cowes, he dived down over Calshot and continued up Southampton Water along the three-kilometre course. I have little doubt that he was being timed, especially as he came back along the course. The machine appeared to be just about all out, and the speed was terrific. Then he varied things by taking Southampton Water at different angles, and repeatedly passed low over the pier where I was watching the flight. On one of these sprints I felt sure that his floats would take off my hat, if not my head.

When certain engines are in the air, notably the racing Napier of 1927 and the Felix, the high-pitched note, rising to a shriek as the engine passes by one, increases the impression of speed which one's eye receives. But the geared and supercharged Rolls Royce has a much less ear-splitting tone, and so when trying to estimate the speed one judges by the eye alone. All estimates must be sheer guesswork, and I shall not endeavour to put a figure to the speed at which Waghorn was travelling. But I got the impression that I had never seen anything travelling so fast before. This opinion was shared by all who were round me, and some of them have seen a great deal of flying.

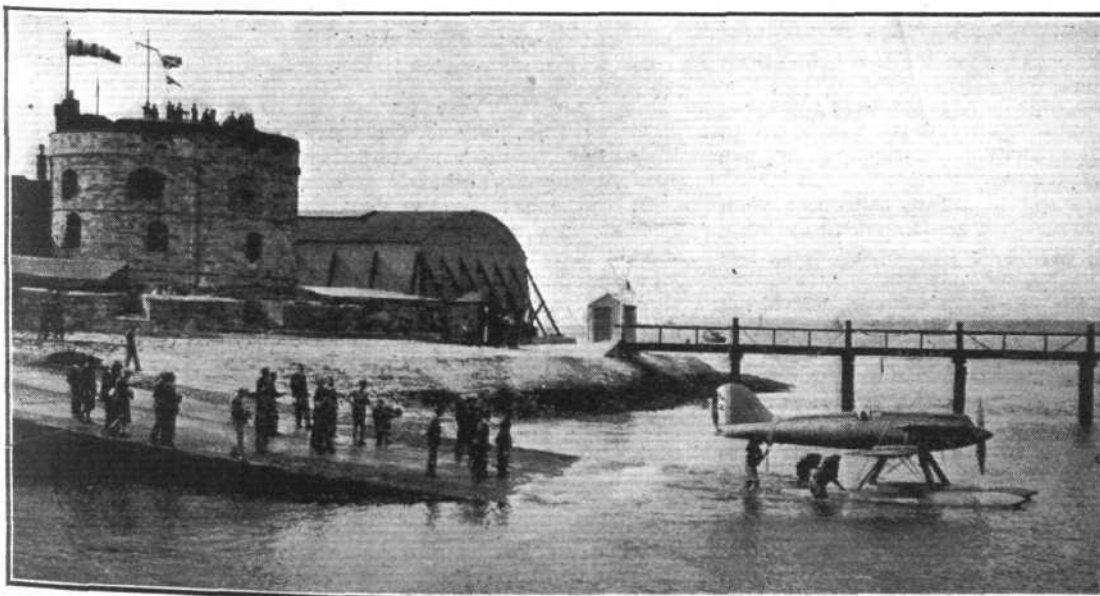
Most of these great bursts of speed ended in spectacular climbs, which showed that in an altitude race this machine would take a lot of beating. It simply went up like a rocket.

Then came a startling change of tactics. Climbing fairly high, Waghorn throttled down and came over Calshot Castle, where he gave an exhibition of slow flying which was quite as spectacular as his recent enormous speed. With the naked eye one could see his propeller ticking over very slowly, and he seemed to be almost standing still in the air. Every moment I thought he must stall, but the S.6 floated along with absolute steadiness. It was like watching a demonstration by a slotted Moth. The machine seemed to take longer to pass over Calshot than it had previously taken to get from Cowes to Southampton.

Of course, he was heading into the wind, which may have been much stronger at his altitude than it was at sea level. Perhaps, when the force of the head wind is deducted from the remarkably low landing speed of this machine, the result was that he was making a ground speed of about 70 m.p.h., which, after the high speed which we had just been witnessing, looked incredibly slow. Waghorn landed after being in the air for 38 minutes, and giving one of the most perfect exhibitions of flying that most of us here have ever seen. I shall certainly be surprised if he does not prove to be one of the three chosen to represent Great Britain in the race.

Then the Gloster Napier, which had been run up on the slipway, was lowered into the water with Orlebar in the cockpit. But at this irritating moment the *Mauretania* came round the corner from the Solent, also fresh from a speed effort, and her wash churned up the water. The S.6 was then being towed in, and the launch had to go about and head across the wash to prevent the seaplane from being swamped. By the time the water had calmed down again, the wind had got too gusty, and the Gloster was hauled in again.

Then came a somewhat wearisome wait. We admired the three flags which have been fixed to the sheds allotted to Italy, Great Britain and the United States; we admired the views; we admired the shipping; we were very glad



## King of the Castle?

The Gloster 6 racing monoplane (Napier racing engine), standing easy within the shadow of Calshot Castle. Its secret performance creates a fascinating speculation.

(“FLIGHT” Photo.)

to see Webster down at Calshot; we had tea; and at last we found ourselves incapable of admiring anything else.

At 7.40 p.m. Orlebar decided that the water was just smooth enough to justify taxiing trials, and again took the water in the Gloster 6. But there seemed to be a malignant fairy at work. Just as he was clear of the slipway—for he started to taxi straight from there and was not towed at all—the C.P.R. *Empress of Canada* appeared from the Solent. Orlebar got into the wash and was tossed about in what looked a very uncomfortable manner. He manoeuvred through the worst of it, and then stopped his propeller. We felt glad to have seen the Gloster Napier actually on the water, but it was quite impossible to judge of her capabilities from what we saw.

*Thursday, August 22.*—There seems to be a fate against the Gloster Napier 6 getting into the air. The weather at Calshot is pleasant enough if one could regard oneself as a mere seaside holiday-maker. But each day there seems to be only one comparatively short period which is just right for taking the racing seaplanes off the water, and if that period is missed for any reason, the day is wasted. The other night everyone stood by till a late hour whistling for wind. Now there is too much.

This morning the position was doubtful, so Orlebar had the new Gloster loaded on to a pontoon and dispatched across to near Lee-on-Solent. He followed afterwards in one of the fast sea cars. When he got to the spot he decided that the water was too rough, so the machine was towed back. She was left on the pontoon at moorings all day, but the weather did not improve and about 7 p.m. flying was washed out.

#### The First Italians Arrive

Everyone was glad to see the advance guard of the Italian team arrive at Calshot today. It consisted of a small party of one technical officer and some warrant officers and airmen, and some large cases which contain two practice seaplanes. They were taken into the Italian shed, and nothing more was seen of them. It appears, however, that they contain two of the Macchi Fiats which were in the race at Venice.

This evening the R.A.F. mounted an armed guard outside the shed, and this practice will be followed every night. Each competing nation will arrange for its own guards inside the shed.

#### The Second Supermarine Rolls Royce

Today the second supermarine Rolls Royce arrived from Woolston. Her number is N 248. The first one, N 247, was at the same time taken back to Woolston. The engine has now been in the air for over 2½ hours, and when one considers running up and taxiing, it would seem to be quite time that it was examined. It has done quite exceptionally well for a racing engine. Perhaps engines will be changed in N 247 if it is found desirable. Larger floats with increased tankage will also be fitted, I understand. As the ingenious Mr. Smith has not yet produced a lap-counter, and as Webster did an extra lap at Venice because he forgot how often he had been round, it is thought advisable to give the pilots a certain margin of petrol.

When speculating on the composition of the British team one should not forget the possibility that one of the Supermarine Napier S 5 machines may be entered for the race. The S 6 inspires great confidence and we have little doubt that the Gloster-Napier will do the same when she has been flown. Her taxiing performance the other evening in water so rough that the propeller was bent and had to be changed has already won her a reputation. Still, for the race it would be a comforting thought that we had one veteran which has proved her capacity to last the course.

*Friday, August 23.*—Today the machines were not even brought out of their sheds. The wind was hopelessly strong. Last night, about midnight, the Rolls Royce engine in 248 was run up.

This morning Marshal of the Royal Air Force, Sir Hugh Trenchard, flew to Calshot from Cattewater in a metal Southampton and inspected the high-speed flight. There is no doubt about his popularity with airmen as well as with officers and the N.C.O.'s and men who had been working until midnight on the Rolls Royce engine were very gratified by the personal interest which he took in their work. After the inspection all work in the sheds was stopped and the men were given a half-day off.

Calshot was plunged in gloom today by the sad news that Captain Giuseppe Motta had been killed at Desenzano. He was a married man aged 34, and was considered the best pilot in the Italian Schneider team. Supposing that the Warrant Officer Agello has been incapacitated by his crash in the Fiat seaplane, the Italian team is now reduced to four

pilots, namely Captain Canaveri, Lieutenants Monti and Cadrigher, and Warrant Officer Dal Molin.

I am informed that five pilots, presumably from this year's team, have taken Bernardi's Macchi Fiat over the three kilometre course and all have exceeded the world record of 512 k.p.h. One at least, possibly, Capt. Motta, is said to have reached a speed of 525 k.p.h. on that machine. I do not pay much regard to reports of speed by irresponsible journalists, but this comes from a source which seems reliable.

*A propos* the Italian Macchi Fiats, one of the two now being erected at Calshot is said to have done 400 hours flying in the last two years. It is now so begrimed that instead of red it has become black and is known as the Mori di Venezia, or Moor of Venice. I suppose that at Calshot it will soon be known as Othello.

*Saturday, August 24.*—Again no flying today. Though the sun shone most of the day the wind was very strong and the white horses were tossing their manes right up Southampton Water.

Still the day was not without interest. In the early morning Orlebar put the Gloster-Napier 4 (N 249) through more taxiing trials for a few minutes, doing several bursts at a respectable speed. I understand that he is now quite satisfied with her performance on the water and will fly her at the first opportunity.

In the afternoon one of the red Macchi-Fiats was wheeled out to the running-up base and her engine was run up. Then she was wheeled back again. She was not the Moor of Venice but No. 80.

Captain Canaveri, one of the pilots of the Italian team, is now at Calshot and I tried to enter into conversation with him. I know about three words of Italian and four of French, and he knows about three words of English and an unspecified amount of French. Consequently, we got on famously together. He is a short, slim, rather swarthy man, with a keen intelligent face, and charming manners. I understood him to say that neither of these two Macchis is Bernardi's record machine, and that these have not got the cut-down wings, though they have smaller engines than they had in 1927. For my part I instructed him that "Gas" is the Americano and not the Inglesi for "Benzina," and that here he must talk about "Petrol." Incidentally, all notices at Calshot are now printed in Italian and French as well as English. I am now quite a dab at translating "Victato Furnare" to my less learned brethren.

Of course, we have all been very disturbed by the suggestion that Italy may withdraw her challenge as it is impossible for the Royal Aero Club to accede to her request for a postponement. As I read the regulations, such a postponement (apart from the question of bad weather) is only possible if no entrant presents himself for a start on the appointed day. So the initiative would seem to rest not with the Royal Aero Club but with the Royal Air Force. But what an enormous dislocation of elaborate preparations would be entailed by such a postponement! Personally, I do not for a moment believe that the Italian team will fail to turn up on the appointed day. That is not the spirit of the Italian Air Force. The Italians here scout the idea. Asked if Motta's death had anything to do with the suggestion, they replied, "In Italy if one man falls, another takes his place." When it was suggested that they might be short of new machines, they pointed to the two Macchi 52 veterans, and reminded us that they had flown at 525 k.p.h.

We had more visitors today, including Sir Alliott Roe and Sir Henry Segrave.

#### The Second Gloster-Napier Arrives

*Sunday, August 25.*—As today was Sunday, there was no flying in the morning.

In the course of the day the second Gloster-Napier 6 arrived. Its number is N.250. It is being erected in the shed. The four machines produced for the race are:—Supermarine Rolls-Royce S.6—N.247 and N.248; Gloster-Napier 6, N.249 and N.250. All these have now been delivered at Calshot.

In the early afternoon the weather was wellnigh perfect, though the sea proved to be rougher out in mid-Solent than it appeared to be binoculars on Calshot. Orlebar sent out N.248 and N.249 on pontoons quite a long way to the east of Solent, and presently followed them in a sea car. The squadron leader was the only officer on duty. D'Arcy Greig, Waghorn, and Atcherley, all in mufti, also went out in a speed boat to watch operations. The Solent was thick with white-sailed yachts and one with blood-red sails, and they made a very pretty show in the bright sunshine. There also seemed to be numerous speed boats about, in addition to those of the R.A.F.

Orlebar first entered the cockpit of the Gloster-Napier

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and put her through a short hydroplaning trial. Then he opened the throttle, heading more or less south-west. He handled the seaplane splendidly, and in under 30 secs. she came unstuck. This very interesting machine was at last actually in the air. But her malignant fairy had not yet been completely exorcised. A partial choke in the petrol feed developed, and after flying for about three-quarters of a mile just a few feet above the water, Orlebar made a beautiful landing and stopped his engine. Speed boats dashed up and took the machine in tow, but it was a long business getting her back to the slipway. Once ashore, Mr. Tullin soon had the Napier engine running up again. The Gloster was then put to bed in her shed.

#### The Second Supermarine Rolls-Royce Tested

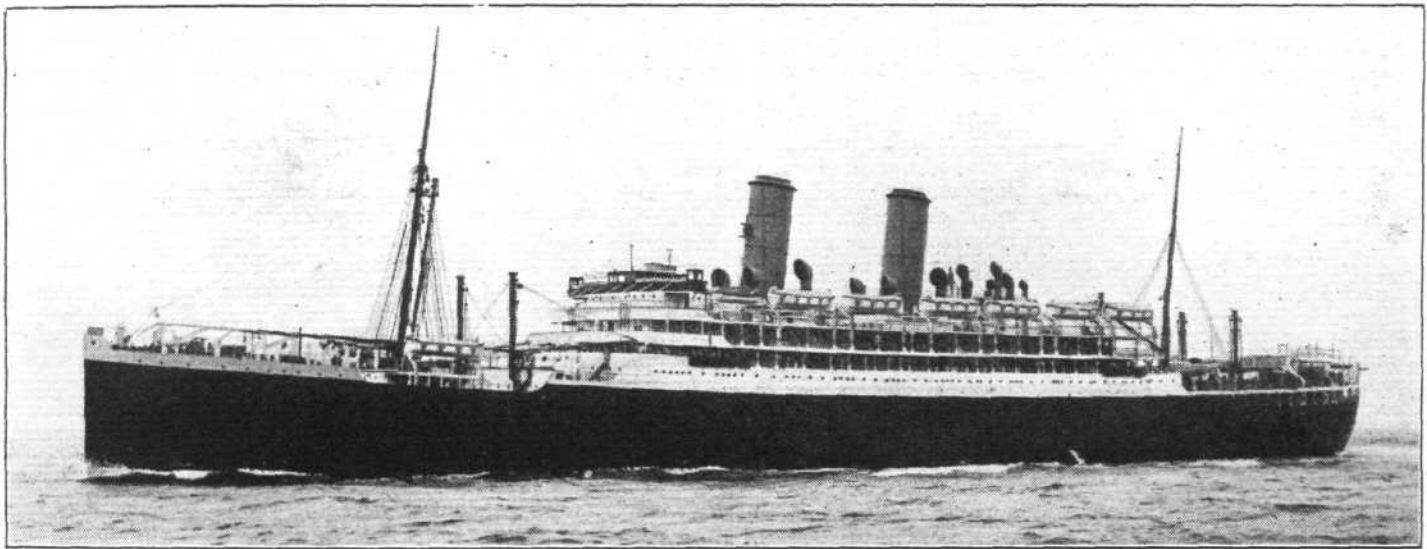
Meantime, Orlebar had gone in a speed boat back to the pontoons, and soon had N.248 in the air. He handled her with confidence from the first, though he duly put her through her paces and gradually increased the steepness of his banks. Then he flew four times up and down the three kilometre course. His throttle was certainly not full open, so I do not think that any significance attaches to this. Probably he wanted to try a long, straight flight.

Today has been a day of wild and furious rumours. Sometimes we had to believe that Italy had definitely

and Great Britain such as Flycatchers; and there might also be a competition in aerobatics. Meantime the four original entrants might consider a later date for holding the actual Schneider contest. The weak point about this suggestion is that all the elaborate Admiralty arrangements for keeping the course clear would have to be kept in operation until the real contest was over.

The discussions were not heated, but each side urged its case warmly. The Italians were asked what they would have thought if their team had come over in good time and then the French had asked for a postponement, and to this no reply was found. It seems, in fact, that if a postponement had been made at an earlier date the French team might have been able to participate.

When at last the discussions ceased, everyone joined in a game of "snob cricket" on the cement, with a tennis ball, while the wicket was represented by a couple of chairs. In the middle of his innings Lieut. Monti was called to the telephone. When the conversation was over he came running back hard and claimed to finish his innings. Capt. Canaveri could not master the mysteries of bowling, so he was allowed to throw, and he took the wicket of an old Gloucestershire county cricketer. They could not understand being caught out, but they never disputed the



The S.S. Orford, which has been chartered by the Royal Aero Club as their official headquarters for the Schneider Trophy Contest on September 7. It will be entirely reserved for members, but the other ship chartered, the Orontes, will have certain accommodation for the public.

scratched, and then another report would raise our hopes once more. Lient.-Commander Perrin came down to Calshot, and stated that he had no official knowledge. But by the time these lines appear in print the true facts will be made known, and so there is small point in recalling all our hopes and despairs. But it should be placed on record that the Italian officers and airmen here were quite as much aghast at the news as we were ourselves.

Monday, August 26.—Heavy mist in the morning was followed by a breeze that was a bit too high. So the training machines were taken out, and Orlebar, in the Avocet, and Greig and Atcherley, in Flycatchers, disported themselves in the sky. I see that last week I was made to accuse one pilot of rolling a Gloster 4. This was due to an error in transmission of my message. The machine was a Flycatcher.

No other flying took place, and the rest of the day was spent in negotiations between the Italian representatives here, Lieut. Monti and Commandant Massai, and members of the Schneider Cup Committee, namely, Air Vice-Marshal C. L. Lambe, commanding the Coastal Area, Wing Commander Sydney Smith, commanding Cattewater Air Station, and Lieut.-Commander H. E. Perrin. Lieut. Monti repeatedly pleaded for a postponement of 30 or even 20 days to get new machines ready. He was told firmly that this was impossible, and that the British machines would fly round the course on the appointed day and, if they were not beaten, would claim a victory in the Schneider Trophy. Then Commandant Massai made the suggestion that, in order to prevent dislocation of arrangements and disappointment of spectators, a "Small Schneider Cup" race might be held on September 7, in which the Italians would race the two Macchi Fiat 52 seaplanes now here against any British machines; another contest might be held between service seaplanes of Italy

and Great Britain such as Flycatchers; and there might also be a competition in aerobatics. Meantime the four original entrants might consider a later date for holding the actual Schneider contest. The weak point about this suggestion is that all the elaborate Admiralty arrangements for keeping the course clear would have to be kept in operation until the real contest was over.

I am not a fisherman, and I like to be believed. Therefore I shall not tell the perfectly true story of the porpoise which wanted to drive a motor car.

Tuesday, August 27.—Another bright sunny day with a sea much too rough for racing seaplanes.

The Schneider Cup Committee held a long meeting here this afternoon.

Lord Thomson visited Calshot today. He arrived in a Southampton, and before alighting at Calshot he flew round the course, but I fear he did not break Webster's record for the 100 kms.

Regarding the request of Italy for the postponement of the contest the following pronouncement was issued by the Royal Aero Club for publication:—

Royal Air Force Base at Calshot at 6 p.m., on Tuesday, August 27, 1929.

The Royal Aero Club has been asked by the Italian Government that the date fixed for the Schneider Trophy Contest (September 7, 1929) should be postponed for one month.

The reasons advanced with the Italian application in support of this submission are (1) that the weather on Lake Garda during the last few weeks has not been favourable to the trials of the new Italian machines, and (2) that as a result of attempting to carry out trials, under unfavourable weather conditions, the Italian team has lost one of its best pilots.

This request (though not actually in the name of the Entrant) has been fully considered by the Schneider Trophy 1929 Organising Committee, and it was decided to express with regret the Committee's unanimous decision that the date of the meeting as fixed in accordance with the F.A.I. and Schneider Trophy Rules could not be altered by the organisers under any circumstances.

This decision was communicated to the Italian authorities, and though subsequently statements as to the withdrawal of the Italian entry appeared in the Press, the Royal Aero Club has received no authoritative statement one way or the other from the Royal Aero Club of Italy or from the Italian Government on the subject.

The decision that the date of the Schneider Contest Meeting could not be altered, was dictated by the imperative character of the International General Rules—in the interpretation of which the Committee's view was emphatically supported both by the Secretary of the F.A.I. and subsequently by the chairman of the Sporting Commission of the F.A.I. in reply to telegrams sent to Paris.

#### 1. Interpretation of Rules.

(a) As Organisers of the Contest, the Committee is bound explicitly by the Regulations of the Schneider Trophy. These regulations provide that the Aero Club organising the next ensuing contest shall notify the F.A.I. in January of the period fixed by them within which the meeting will be held. It is also provided that three months before the meeting the precise date shall be specified. The date thus fixed for the 1929 contest (September 7, 1929) was duly notified by the Royal Aero Club to all concerned and its unalterability is stated in plain terms in the General Rules of the F.A.I., under which the Schneider race must obligatorily be run—in accordance with the deed of gift. The Royal Aero Club Schneider Committee stands in a fiduciary position in relation to the public, the entrant, the actual competitors and all those who might have entered for the contest. That is to say, the Committee is bound in all its rulings strictly to observe the rules laid down by the F.A.I., and it is the special function of the stewards of the meeting to see that rules are enforced. No question of nationality or partiality can in any way enter into this.

(b) The Organising Committee has no power whatsoever to alter the date once fixed for the next ensuing meeting. If any alteration were in fact to be now made in the date first fixed for the contest, it would follow that competitors (e.g., the French Aero Club whose entries were withdrawn prior to a change in date) would have the right to be aggrieved at an extension of time which might, had it been given at the outset, have enabled them to avoid their retirement.

It has not yet been possible to learn who is the official representative of the Italian Aero Club to whom to transmit the Committee's decision, but as the matter was urgent, the decision of the Royal Aero Club was sent to the Italian Air Attache, on August 23, 1929, and care was taken to make it clear that this ruling had been reached solely on the compulsion of the rules.

Though no consideration of convenience or expense can modify the purely sporting character of a decision based on the rules—it is of interest to observe that rules safeguard the position of all those who have trusted to their strict enforcement.

It will readily be appreciated that the Schneider Contest, in addition to being a contest between individual pilots and between eminent aircraft and aircraft engine designing firms, is an event of national significance. The designing of machines for the Schneider Trophy Contest has involved the mobilisation of national scientific and research laboratories; the construction of the aircraft and engines has involved some disorganisation of the works production programmes of the makers of the aircraft and aircraft engines concerned; and, further, considerable dislocation would arise in the general training programme of the Royal Air Force, since an important Air Force Station which has been entirely devoted to Schneider Trophy purposes would remain unavailable for its normal purposes for a further period of at least a month. Considerable effort and training are required to produce a satisfactory team of high-speed pilots for races such as the Schneider Trophy Contest. All these efforts were made and authorised by the interested Government's Clubs and makers and by the public and civil authorities concerned on the understanding that the agreed date was definite and final. Moreover, the time factor is of vital importance in any technical contest concerning a science which is rapidly advancing from month to month. It is necessary for fairness to ensure that each competitor shall have as long a notice of the date fixed for the contest as the other competitors, thus giving them ample time

within which to mobilise their national resources and to concentrate on the production of the best machines they can provide by the due date. With this in mind it appears to be manifestly unfair to make any extensions of the period of preparation for the contest which is not enjoyed by all entrants—and which was not put at the disposal of potential competitors.

The Schneider Trophy Contest makes an immense appeal to the imagination of the public. It is the speed race *par excellence*; and the successful organisation of the contest involves months of hard work by numbers of public bodies, transport, shipping, and other companies dealing with individual aspects of the public demand. For example, arrangements must be made with the Naval Authorities and Harbour Board concerned with the area selected for the meeting to ensure that the course will be clear of shipping and properly marked out by buoys, etc., for the safety of the flyers; that proper arrangements are made for First-Aid and Patrol Boats; and that adequate precautions are taken so as to ensure that shipping thus kept out of the neighbourhood of the course and of the ports is not seriously embarrassed in relation to its ordinary functions. All this requires long preliminary notice of the precise date involved.

The organisation of the race also involves an elaborate scheme of communications both by speed boats and by wireless. Officials at the starting and finishing point of the contest must necessarily be in touch with every point on the course, and with every official ship employed thereon. This has been found to involve the allocation of specific wavelengths for wireless purposes, a special control of all routine wireless on ships and arrangements for telephonic and telegraphic facilities. It is impracticable to repeat the dislocation of normal work at short notice.

It so happens that the Spithead area selected for the 1929 contest is the channel through which the bulk of shipping enters Portsmouth and Southampton, and, of course, it is imperative in the interests of safety that all shipping routes on the course should be closed during the contest. It has been necessary to instruct vessels expected to reach Southampton or Portsmouth at or about the time of the contest of the arrangements made, thus ensuring that they do not enter the contest area. This in turn involves long-dated prior notification of the arrangements and of the date to ships from distant stations, and involves notice of sea control some months in advance.

Special arrangements have to be made with steamship, railway and road transport organisation for the carriage of the course of spectators who are expected in hundreds of thousands. Such arrangements cannot be made in a day. Plans for policing the road, for example, must be made months ahead, and railway time tables and the allotment of special ships require similar foresight; and once these arrangements are made they cannot in practice be cancelled and deferred without grave inconvenience and loss. Apart from the question of expense, the abandonment for one month of the organisation now set up would so discourage all the workers, the public bodies, the companies and authorities concerned, etc., that a new organisation could not be inspired with any confidence and could not be brought together again so as to give the same degree of efficiency.

The authorities in control of towns and areas adjacent to the course have loyally co-operated in catering for autumn visitors to their districts to witness the contest. These towns have already spent some thousands of pounds in erecting public enclosures, in foreseeing the needs for food, shelter, car parks and similar facilities. After the close of the holiday season and as autumn weather breaks, it would be impracticable and unreasonable to expect these towns to maintain or alter their arrangements for a month later, thus bringing them into a period in which most of their usual holiday visitors will have completed their visit.

The weather difficulty is also important to the flyers. In the Spithead area the weather conditions and the sea conditions in October near the equinox are undoubtedly less advantageous than those prevailing in early September. (The date September 7 was selected after consultation with the British meteorological authorities, and after examining weather and hydrographic records over a period of years.) It would be most unwise for the Royal Aero Club, even if it could do so, to fix for the contest a period in which unsuitable weather will probably be prevalent and when therefore the precise day of the race will itself be liable to the day-to-day postponement on the weather account foreseen in the regulations.

Shipping companies and hotel proprietors throughout the area adjacent to the course have made advance arrangements

(Continued on page 928.)

## PRIVATE



## FLYING

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## GERMANY PROVISIONALLY WINS INTERNATIONAL LIGHT 'PLANE TOUR

But British Engines Excel

AS we go to press, the final positions of the leading competitors in the International Light 'Plane Tour of Europe are still uncertain. The preliminary announcements from the Aero Club de France award the highest points to the German competitor, Herr Morzik, namely, 138.50. He flew a B.F.W. monoplane with a 70-h.p. Siemens engine. Capt. H. Broad, flying the Gipsy-Moth, came second, with 135.25 points, and Mr. J. Carberry was placed third, with 131.00 points. He flew a Raab-Katzenstein, fitted with a Cirrus-Hermes. Thus, if these positions are confirmed, Germany wins the competition, but Great Britain achieved a considerable triumph, for it not only secured second place, but largely contributed to the success of Mr. Carberry. Another factor which heightens our victory is that only two English machines competed against nearly 50 rivals, and the two highest average speeds were made with the British engines; the Cirrus-Hermes and Gipsy, namely, 96.3 m.p.h. and 95.6 m.p.h., respectively. The hitch which has occurred to hold up the final result involves the three English pilots, Miss Winifred Spooner, Capt. H. Broad, and Mr. J. Carberry. It is alleged that they flew over prohibited areas whilst crossing Italy during the European tour, and inadvertently shortened their course, which went in favour of the time taken by them for the whole circuit. It is said that if this charge is confirmed, the rules of the contest render them liable to disqualification. The Contest Committee is now investigating the matter, and a report from them is expected shortly.

But if they suffer by this report, the moral triumph of the competition will still be Great Britain's. A provisional list of the leading competitors, with the points awarded, is as follows:—

Pilot.	Machine and Engine.	Speed	Regularity	Re- place-ments	Practical Qualities	Total
Herr F. Morzik, B.F.W. (Siemens)	70	35	14	19.50	138.50	
Captain H. Broad, Gipsy-Moth	80	35	14	26.25	135.25	
Mr. J. Carberry, RK (Cirrus-Hermes)	70	35	14	12.00	131.00	
Herr R. Lusser, Klemm (Salmson)	48.75	35	14	30.50	128.25	
Capt. Guazzetti, Romeo (Fiat)	50	35	14	28.25	127.25	
Herr V. Dungen, B.F.W. (Siemens)	57.50	35	14	20.25	126.75	
Mr. Kleps, Antilope (Walter)	45	35	14	32.50	126.50	
Capt. Gastaldo, Romeo (Fiat)	50	35	14	25.25	124.25	
Capt. Gelmetti, Romeo (Fiat)	55	35	14	18.00	122.00	
Miss W. Spooner, Gipsy-Moth	50	35	14	22.50	121.50	
Herr Roeder, Junkers (Genet)	41.25	35	14	30.25	120.50	
Capt. Lombardi, A.S.I. (Fiat)	50	35	14	18.50	117.50	
Signor Benassatti, Romeo (Fiat)	48.75	35	14	20.00	117.75	
Signor Botalla, A.S.I. (Fiat)	50	35	14	18.00	117.00	
Herr Poss, Klemm (Salmson)	35	35	14	30.25	114.25	
Herr Wirth, Klemm (Salmson)	32.75	35	14	32.50	114.25	
Herr Kneer, Junkers (Genet)	32.75	35	14	29.50	111.25	
Herr Offermann, B.F.W. (Siemens)	40	35	14	20.25	109.25	
Herr Kirsch, Klemm (Cirrus)	28.75	35	14	27.75	105.50	
Herr Siebel, Klemm (Salmson)	24.75	35	14	30.25	104.00	
Capt. Mazotti, Breda 15 (Cirrus)	27.75	35	14	26.00	102.75	

Note:—The total points which could be achieved were 165.



Flt.-Lieut. R. R. Bentley, A.F.C., has just completed his fourth flight between South Africa and Great Britain in the same Cirrus-Moth. His latest trip was for the purpose of flying a business man, Mr. M. Filsinger, to Germany from Johannesburg. They left on July 10, and reached Berlin on August 22, having flown via Nairobi, Cairo, Constantinople, Sofia, Vienna and Prague. Flt.-Lieut. Bentley then flew on to London. Our illustration marks the arrival at Berlin. (Left to right) Mrs. Bentley, Mr. M. Filsinger, Flight-Lieut. Bentley, Dr. Millner, and Capt. Udet, the German wartime "ace."

# LIGHT PLANE CLUBS

## CINQUE PORTS FLYING CLUB, LTD.

(WEEK ENDING AUGUST 24).—Pilot Instructor: K. K. Brown. Ground Engineer: R. H. Wynne. Machines: RI and PM. Total for week: 27 hrs. 30 mins. Dual instructions: Mr. King, 2 hrs.; Mr. T. Bowring, 2 hrs.; Mr. J. Bowring, 2 hrs.; Dr. Furlong, 6 hrs.; Mr. Dorman, 1 hr. 30 mins.; Mr. Pither, 15 mins.; Mr. Coates, 30 mins.; Mr. Cooke, 1 hr. 30 mins.; The Hon. T. A. Verney Cave, 15 mins.; Mr. J. J. Jones, 3 hrs.; Mr. Wynne, 30 mins.; Mr. Hyde, 1 hr.; Mr. Paul, 1 hr.; Mr. L. Milton, 1 hr. Total, 14 members: 22 hrs.

Soloist under instruction: Mr. Cooke: 45 mins.

"A" Pilots: Mr. R. Dallas Brett, 45 mins.; Mr. Ellis, 1 hr. 15 mins. Total, 2 members: 2 hrs.

Joyrides: (6), 1 hr. Tests: (11), 1 hr. 15 mins.

The weather was not so good this week, and accounts for the low time. Mr. J. J. Jones, of Pinner, and Mr. E. H. Paul, of Bromley, were new members who commenced instruction during the week, and Dr. Furlong, of Waterford, continued to pile up the hours in his attempt to take his "A" licence before his return to Ireland.

## HAMPSHIRE AEROPLANE CLUB

(WEEK ENDING AUG. 23).—Pilot instructors: Flt.-Lieut. F. A. Swoffer, M.B.E., and Mr. W. H. Dudley. Ground engineers: Messrs. E. Lenny and S. W. Riches. Aircraft: Gipsy Moth G-AAJR, Avian G-EBVI, and Spartan G-AAFR. Dual instruction: 40 hrs. 30 mins. Solo flying: 2 hrs. 30 mins. "A" pilots: 32 hrs. 30 mins. Passengers: 55 mins. Instructors, solo and tests: 1 hr. Total, 77 hrs. 25 mins.

Members are reminded that tickets for the ss. *Prince of Wales*, which has been chartered by the club for the Schneider Trophy Contest, are being rapidly sold. Those who still wish to purchase tickets are advised to send a remittance to the secretary immediately to avoid disappointment. Members are also reminded that there will be no flying at the club from Friday, September 6, until such time as the race is over.

This week's flying time constitutes a record in the history of the club. We must compliment Flt.-Lieut. Swoffer, whose last week it is with us, in completing his service in so extremely satisfactory a manner.

He has been chief instructor at the club since January, 1928. During this period, club machines have been flown for over 2,500 hrs., and 46 members have obtained "A" licences. We sincerely congratulate Flt.-Lieut. Swoffer on this record, and as a small mark of appreciation, the club has presented him with a silver cigarette box, suitably inscribed. Everyone combines in wishing him success and good luck in his new venture overseas.

## LANCASHIRE AERO CLUB

(WEEK ENDING AUGUST 17).—Flying time: 25 hrs. 20 mins. Instruction: (13), 9 hrs. Solo flights: (20), 8 hrs. 25 mins. Passenger flights: (17), 5 hrs. 45 mins. Tests: (13), 2 hrs. 10 mins.

Instruction, with Mr. Hall: Messrs. Moore, J. H. Ashworth, L. A. Sellers, W. Russell, Serck, Hardy, Shaw, Griffiths, Brocklehurst, Butt, Barlow, J. C. Sellars.

Machines in commission: XD, EC, MQ. Soloist (under instruction): Serck.

Pilots: Messrs. Meads, R. F. Hall, R. F. Davies, Mills, Goss, L. A. Sellers, Garner, D. Nelson, Twemlow, Hardy, Kay, Lacayo, Whitehouse, Butt, W. Ashworth, Maxwell, Foote, Michelson, Gattrill.

Passengers, with Mr. Michelson: Goss. With Mr. Mills: Griffiths, Serck, Burns. With Mr. Meads: Goss, Leigh, Miss Leigh, Miss Goss. With Mr. Twemlow: Mrs. Twemlow. With Mr. R. F. Hall: Sellars, Miss Collier. With Mr. R. F. Davies: Williamson, Miss McLean. With Mr. R. F. Davies:

Miss Griffin, Brown. With Mr. Lacayo: Whitehouse. With Mr. Hall: Stubbs.

The following new members commenced instruction: Griffiths, J. C. Sellars

## MIDLAND AERO CLUB

(WEEK ENDING AUGUST 24).—The total flying time was 51 hrs. 55 mins. Dual, 29 hrs. 30 mins.; solo, 17 hrs.; passenger, 3 hrs. 30 mins.; test, 45 mins. Cross-country flight to Stag Lane, 1 hr. 10 mins.

The following members were given dual instruction by Messrs. W. H. Sutcliffe and T. W. J. Nash, A.F.M.:—Mrs. Vereker, A. E. Coltman, H. A. Taylor, G. Norton, F. G. Robinson, Harvey Sangster, L. W. Farrer, T. F. Hallam, B. P. A. Vallance, F. Norman, G. Mander, H. Beamish, Mrs. Burnett, P. Stone, C. T. Davis, J. E. Yardley, J. H. Vickers, A. P. Hunt, A. F. Hill, T. G. Ellison, S. J. Eardley-Wilmot, E. C. Merrick, J. P. Saul, P. M. Patel, F. T. Lydall, A. C. Isaac, H. E. Evans.

"A" Pilots:—R. C. Baxter, F. G. Robinson, H. J. Willis, R. D. Bednell, P. B. Hackett, J. Rowley, R. L. Jackson, J. R. Bond, J. Cobb, F. J. Steward, A. P. Hunt, J. K. Morton, W. Swann, S. Duckitt.

Soloists: F. Norman, F. T. Lydall, P. A. Vallance, J. Eardley-Wilmot, H. B. Evans, H. A. Taylor, H. Coleman, P. Stone. Mr. P. Stone successfully made his first solo. EB-LW was flown to Stag Lane for renewal of C. of A. All the flying this week was performed on two machines.

## NEWCASTLE-UPON-TYNE AERO CLUB

(AUGUST 25).—Instructor: G. M. S. Kemp. Engineer: W. Dunning. Assistant: J. Tait. Aircraft: (3), PT, LX, QV. Flying time: 33 hrs. 45 mins.; instruction, 16 hrs. 20 mins.; solo training, 3 hrs. 40 mins.; "A" Pilots, 8 hrs.; Passengers, 4 hrs. 30 mins.; tests, 1 hr. 15 mins.

Notes.—Mr. E. J. Griffiths and Mr. F. L. Mays both completed very successful first solo flights last week.

Indeed, Mr. Griffiths very soon put in the minimum amount of time and completed his tests. Mr. R. T. Liddell also completed his tests for the "A" licence last week. Bad weather on Wednesday accounted for a poor flying day. Rain began to fall early in the morning and continued until lunch time but in the afternoon the sun shone and so allowed us to do a little flying. There was great joy in the camp when it was learned that LX was soon to take the air after having a long stay in the workshops, being overhauled.

Cramlington Aerodrome was the scene of great importance on Saturday morning, when the Prime Minister landed while on his way to London. The pilot landed to enquire of the weather, and after having partaken of a light refreshment, took off again. The weather farther south was bad and they came back again and lunched at the club house. They set off again after being filled up with petrol, and a flying officer led the way to Catterick on an Atlas.

## YORKSHIRE AEROPLANE CLUB

(REPORT FOR JULY).—Pilot Instructor: Flt.-Lieut. H. V. Worrall, D.S.C. Ground engineer: R. Morris. Assistant ground engineer: G. Speight. Total flying time for July: 146 hrs. 35 mins. Machines in commission, 3:—G-EBSV, G-EBRF, and G-AABD.

Mr. H. Collins and Mr. G. H. Lloyd successfully passed their tests for their "A" licence. Nine flying members and six associates joined during the month. Our total number of members at the end of the month was 321. On July 6, a large crowd visited the aerodrome in order to see the King's Cup Competitors, and we were very proud that it should be a member of our own club that won the race.

On the same day we had a visit from Sir Alan Cobham in his air liner, "Youth of Britain," and in spite of the unfavourable weather conditions, Sir Alan took up 250 school children and a number of distinguished gentlemen from Leeds and Bradford.

The Duchess of Bedford, Capt. C. D. Barnard (left), and Mr. Bob Little, at Bristol for the celebrations of their record flight to India and back in the Fokker (Jupiter) monoplane. A luncheon was held at Bristol on August 13, at which the Lord Mayor presided, who said it was a matter for congratulation that the engine used was manufactured and designed in Bristol. In responding, the Duchess said that the flight had been strenuous for her two companions, but a pleasure cruise for herself. With the best of pilots, the best of mechanics, and the best of engines, nothing but weather conditions could have robbed them of success. Amongst those at the luncheon were Mr. Herbert I. Thomas, Mr. Roy Fedden, Mr. Grant, Capt. Uwins, and Capt. Barnwell of the Bristol Aeroplane Co.





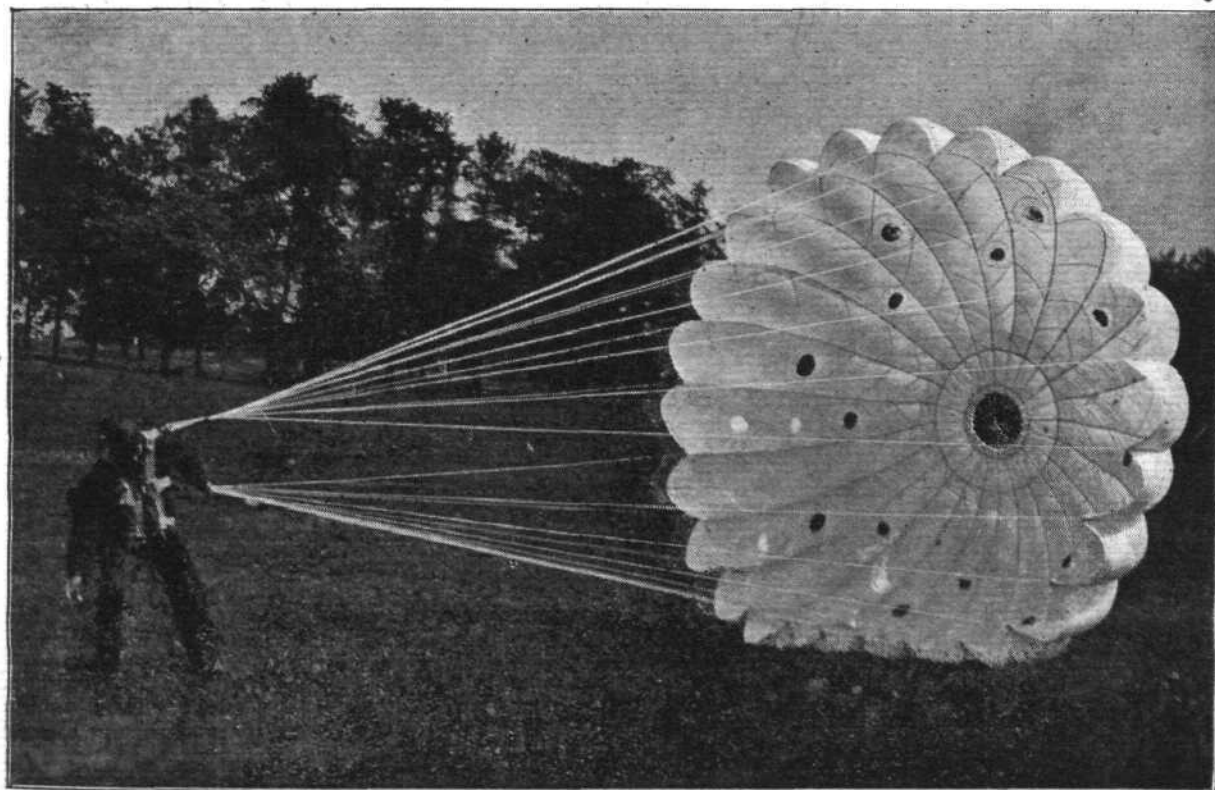
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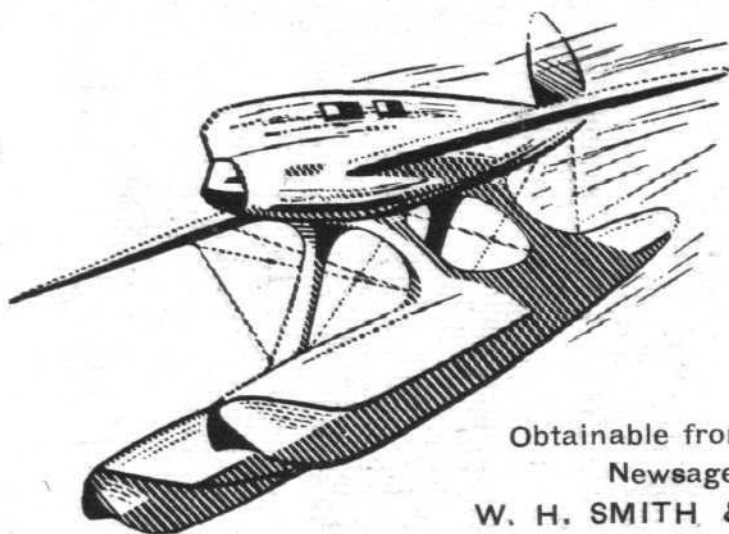
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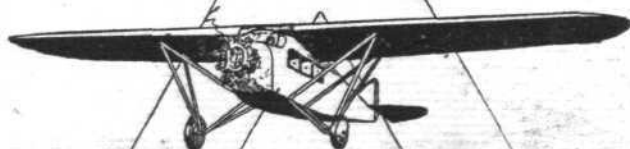
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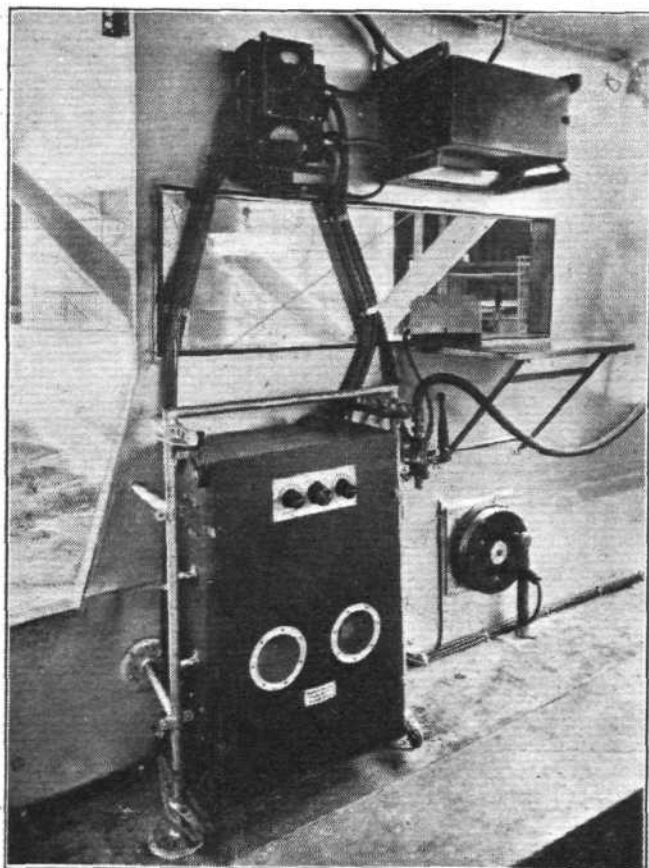
### AN ITALIAN ALL-METAL MACHINE FOR MILITARY SERVICE

ONE of the recent productions of the well-known Italian firm of Caproni is the "Ca 97 Colonial," some brief particulars of which we are able to give below. This machine, which is of all-metal construction, is intended for Colonial work, and the various requirements for military and colonial service have been combined in its design and embodied in the one machine. For example, it is suitable for troop-carrying—for conveying reinforcements, at a moment's notice, to distant forces, or relieving them—whilst at the same time it can also be employed as a useful offensive machine, for the protection of marching troops, reconnaissance, patrol work, scouting, bombing, etc.

An equally important use to which it can be put is the transport of food, water, munitions, and other urgent materials; and finally, for the transport of sick and wounded. For colonial work, therefore, it will be seen that this machine should serve a useful purpose indeed.

For troop carrying it can carry 10 armed soldiers—a small number, perhaps, individually, but with a fleet of machines, possibly making several return journeys from the base, which could easily be accomplished owing to its high speed, would not be such an unimportant number all told, especially for colonial expeditions or actions.

As regards food transport, etc., the Caproni "Colonial" is able to carry 600 kgs. (1,320 lbs.) of useful load in



A view inside the Caproni "Ca. 97 Colonial," showing the wireless installation.

addition to pilot, crew, and fuel. For ambulance work it can carry one seriously wounded "case" on a stretcher, two slightly wounded, one doctor, and an assistant or nurse; or six slightly wounded, doctor, and nurse. In this sphere of activity we need not dwell further on the advantages offered, for it has been proved in many cases, in all parts of the world, that the aeroplane can provide most valuable service—and this is particularly so in colonial countries where distances are great and road transport is unsafe or dangerous.

As an offensive [weapon] provision has been made for the equipment of two machine guns and a load of 250 kg. (551 lbs.) of small bombs, the installation and operation, etc. of which have been carefully considered in the design.

Turning now to the machine itself, the Caproni "Colonial" is a high-wing monoplane of the "semi-cantilever" type with the fuselage carried up to the wing, the pilot being located forward and protected by a windscreen extending up from the fuselage to the leading edge of the wing. Troops, gunners, sick, or cargo are carried in a large cabin, beneath the wings, in the fuselage.

The wings are braced by a system of struts, one main set extending from the lower fuselage longerons to the wing spars, and another set from the top of the fuselage to a point nearly midway on the main struts, where the landing gear absorber struts are attached. The wings are set at a slight



THE CAPRONI "CA. 97 COLONIAL": Two views of this Italian all-metal machine, which is intended for Colonial military service.

dihedral, but have no sweep-back, and the fuel tanks are located in the wings. An adjustable tail-plane is fitted.

A very wide track landing gear is provided, this being of the non-axle type, the wheels being carried by V-members from the lower longerons of the fuselage, and the absorbers by vertical members extending up to wing struts. We understand that brakes are also fitted.

Normally, the "Caproni Colonial" is powered with a single 400-h.p. engine (or 450-h.p. "Jupiter") in the nose of the fuselage, but a noteworthy feature of this machine is that it can, if required, be equipped with three 130-150 h.p. engines, by mounting the two extra engines beneath the wings, on the bracing struts—at the junction of the two sets referred to above. Also, it may be converted into a twin-engined job by fitting two 200 h.p. engines (such as the Armstrong Siddeley "Lynx") on the wings only.

This multi-engine feature is illustrated by Ca. 97 Commercial six-passenger machine, which is similar in most respects to

the "Colonial," and which is employed on the Rome-Milan-Monaco air line.

The principal characteristics of the Caproni "Colonial" are:—

Span .. ..	52 ft. 6 in. (15.970 m.).
Overall length ..	35 ft. (10.710 m.).
Height .. ..	7 ft. 8 in. (3.350 m.).
Wing area .. ..	430.4 sq. ft. (40 sq. m.).
Wheel track .. ..	16 ft. 4 in. (4.040 m.).
Weight empty ..	2,646 lb. (1,200 kg.).
Useful load .. ..	2,205 lb. (1,000 kg.).
Total weight ..	4,851 lb. (2,200 kg.).
Speed range .. ..	56-119 m.p.h. (90-192 k.p.h.).
Endurance .. ..	Five hours.

Note.—The dimensions of the "Commercial" type are, with one or two exceptions, the same.

C. D. R



THE CAPRONI "CA. 97 COMMERCIAL": This is a three-engined version of the "Colonial" for commercial air services.

## BOOK REVIEW

"Some Famous Air Achievements": This is the title of a brochure published by D. Napier and Son, Ltd. Napier aero engines are forever linked with some of the finest performances in aviation history. A Napier engine has given Great Britain the Schneider Trophy (1927). That feat alone, as the brochure rightly claims, gave a stimulus to the British aircraft industry. The world attention was centred on that Olympic struggle of 1927 at Venice, and rivals and friends alike felt a deep debt of gratitude to Napier's for their paramount part in the success. Then the Aerial Derby in the years after the war were won in succession by Napier engines.

Later triumphs include the great performance of Flt.-Lt. D'Arcy Greig of last year, when he attained a speed of 319.57 m.p.h. in a Supermarine-Napier monoplane. Incidentally, after that superb achievement the engine was minutely examined and found to be in excellent condition. But it is not in speed tests alone that the Napier has made

history. It has an equal reputation for outstanding Royal Air Force cruises across the world which demand extreme reliability. There was the performance of the R.A.F. Supermarine "Southampton" flying-boats, fitted with Napier engines, when a total engine mileage of 180,000 was flown in the cruise from Cattewater, Plymouth, to Singapore and round Australia in 1927-28, which lasted nearly a year. Finally we come to the recent record non-stop flight from Cranwell to Karachi in 48 hours by the Fairey monoplane fitted with a Napier engine. Any of these performances was sufficient to bestow a high reputation on Napier engines. In the brochure published by the company in artistic style and illustrated with splendid etchings, each of which is worth framing, the story of Napier's triumphs is told in simple language and repeated in French. There is one small error which we only point out so that a correction might be made in future editions. The caption to the D.H. "Hound" describes it as a Dornier-Napier flying-boat.

### (Schneider Contest.

Contd. from page 924.)

for the reservation of accommodation to the general public. In all such cases hardship and countless difficulties would arise if the contest were postponed.

Accordingly it would appear that the unchangeable character of the rules does in fact make for fair play in spite of the regrettable hardship on an esteemed competitor who has suffered severe misfortunes with which the Royal Aero Club and the Committee are in full sympathy.

It is desired to emphasise that, irrespective of whether or not Italian or American entries ultimately materialise, it is the intention to hold the contest on September 7, when the British team will race as though they were competing against other national entries.

It is reported from New York that Lieut. Al. Williams again failed to get the Mercury seaplane off the water, and the U.S. Navy Department has therefore abandoned all hope of him competing in the Schneider race. It is proposed, however, to prepare the seaplane for an attempt upon the world's speed record in Chesapeake Bay.

WE record with great regret that Capt. Motta was killed while flying the Macchi M.69 over Lake Garda, and we tender our deepest sympathy to his brother officers in the Italian Schneider team. The loss of Capt. Motta gave rise to a series of conflicting reports as to whether the Italian team will compete in the race, but the latest news rather confirms our opinion that these were somewhat premature, and there is now a report to hand from Rome stating that the Italian pilots left for England on Tuesday.

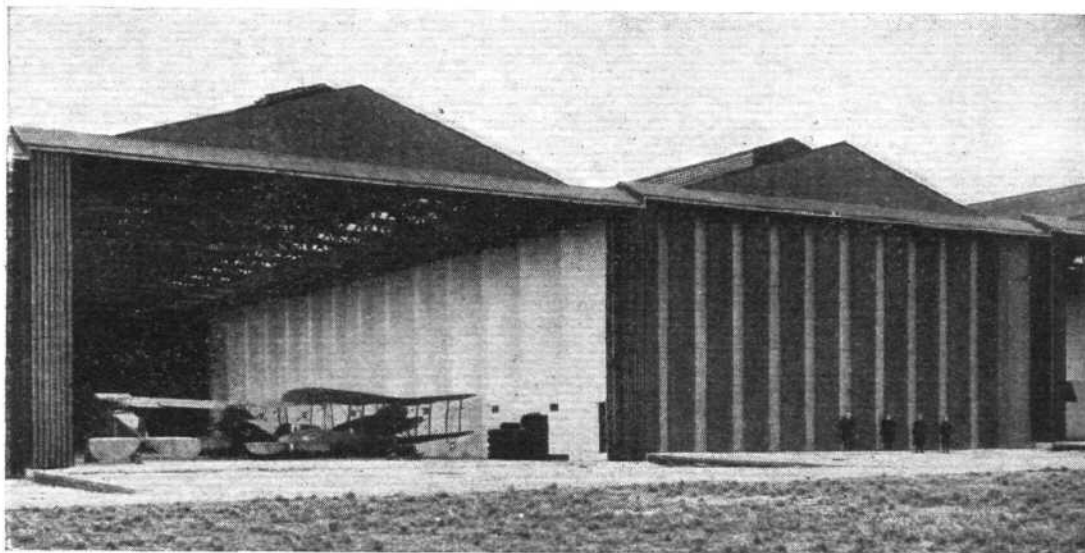
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# THE ROYAL AIR FORCE

London Gazette, August 20, 1929

## General Duties Branch

Lieut.-Comdr. H. L. St. J. Fancourt, R.N., is re-attached to R.A.F. as Flying Officer with effect from August 1, and with seniority of June 16, 1924. Lieut.-Comdr. R. St. A. Malleon, R.N., is re-attached to R.A.F. as Flight-Lieut. with effect from Aug. 1, and with seniority of March 8, 1927. The following Pilot Officers on probation are confirmed in rank.—K. G. Vandeyck; Aug. 2. F. K. Wood; Aug. 7.

The following Pilot Officers are promoted to rank of Flying Officer: H. J. Cross; Jan. 8 (substituted for Gazette June 21). A. G. Lester; April 9. A. W. Hunt; June 17. J. B. Mackenzie; June 30. J. H. T. Simpson; June 30. N. C. Odber; July 9. E. J. H. F. Moreton; July 13. W. R. C. Wilkins; July 15. B. W. Figgins; July 15.

Flight-Lieut. F. L. Luxmoore, D.F.C., is placed on retired list at his own request; Aug. 3. Flying Officer M. F. Morris is placed on retired list on account of ill-health; Aug. 17. The following cease to be attached to the R.A.F. on return to Naval duty; Aug. 1:—Lieut.-Comdr. R.N. Flying Officer R.A.F.—J. H. I. Wood. Lieuts. R.N. Flying Officers R.A.F.—G. C. Dickins, L. G. Richardson, J. E. Vallance, T. H. Villiers.

The short service commission of Pilot Officer on probation F. N. D. Scally is terminated on cessation of duty; July 23.

## RESERVE OF AIR FORCE OFFICERS

### General Duties Branch

W. T. Taylor is granted a commn. in Class A.A. (ii) as a Pilot Officer; Aug. 7. The following are granted commns. in Class A.A. (ii) as Pilot Officers on Probation.—T. G. E. Price; Aug. 1. G. P. E. Howard; Aug. 7. H. C. Devitt; Aug. 8. P. Bailey is granted a commn. in Class A as a Flying Officer on probation; Aug. 10. The following Pilot Officers on probation are confirmed in rank:—M. G. B. Clark; Aug. 11. A. G. Douglas; Aug. 13. E. F. Briscoe; Aug. 14. M. F. Ogilvie-Forbes; Aug. 20.

The following are transferred from Class A. to Class C.:—Flight-Lieut. S. H. Potter; July 26. Flying Officer J. F. Dewar; May 12. Flying Officer J. F. Nicolas; Feb. 28. The commissions of the following Pilot Officers on probation are terminated on cessation of duty:—R. S. Odd; July 31. G. J. Konried; July 25.

## AUXILIARY AIR FORCE

### General Duties Branch

No. 605 County of Warwick (Bomber) Squadron.—The following to be Pilot Officers.—J. V. Wood (July 18); R. P. Gibb (July 19).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified:—

### General Duties Branch.

Group Captain H. M. Cave-Browne-Cave, D.S.O., D.F.C., to 205 (Flying Boat) Sqdn., Singapore, 9.8.29. To command.

Wing Commanders: B. E. Smythies, D.F.C., to Station H.Q., North Weald, 10.8.29. To command. G. S. M. Insall, V.C., M.C., to Station H.Q., Donibristle, 10.7.29. To command. G. H. Bowman, D.S.O., M.C., D.F.C., to H.Q., Inland Area, 9.8.29. For Air Staff duties.

Squadron Leaders: L. H. Cockey, to H.Q., Inland Area, 13.8.29. A. G. Bond, A.F.C., to H.Q., Coastal Area, 12.8.29.

Flight Lieutenants: A. R. Churchman, D.F.C., to No. 2 (A.C.) Sqdn., Manston, 16.8.29. T. B. Bruce, M.C., to Experimental Section, R.A. Estab., S. Farnborough, 3.8.29.

Flying Officers: R. L. Burnett, to R.A.F. Depot, 13.7.29. R. T. Read to Electrical and Wireless Sch., Cranwell, 15.7.29. W. J. Coadwell, D.S.M., to R.A.F. Depot, 25.7.29. J. E. Allen, to No. 9 (Bomber) Sqdn., Manston, 10.8.28. G. V. Carey, to Central Flying Sch., Wittering, 6.8.29. G. B. Beardsworth, to Home Aircraft Depot, Henlow, 13.7.29.

Pilot Officers: E. H. Jennings, to No. 2 Armoured Car Company, Middle East, 9.8.29. A. C. P. Westhorpe to Armoured Car Wing, Hinaidi, 9.8.29.

### Stores Branch.

Squadron Leader W. C. Clark to H.Q., Air Defence of Gt. Britain, Uxbridge, Middx., 15.8.29.

Flying Officer P. H. Wilcox, to Supply Depot, Aden, 10.8.29.

### Accountant Branch.

Flight Lieutenants: J. L. Armstrong, to Station H.Q., Upavon, 24.7.29. F. W. Arthurton, to R.A.F. Base, Calshot, 1.9.29.

Flying Officer V. H. Lewis, to No. 2 (A.C.) Sqdn., Manston, 8.8.29.

### Chaplains Branch.

The Rev. D. F. Blackburn, to H.Q., R.A.F., Cranwell, 8.7.29.

### Legal Branch.

Flight Lieutenant G. S. Marshall O.B.E., to H.Q., Middle East, 9.8.29.

## Royal Air Force Memorial Fund

THE usual meeting of the Grants Sub-Committee was held on August 22. Mr. W. S. Field was in the chair. The Committee considered in all 11 cases, and made grants to the amount of £386 3s. Next meeting September 5, Fund offices, 2.30 p.m.

## Calgary

THE city of Calgary, in Alberta, is planning the completion of one of the finest airports in Canada. This is a sequel to the air mail service across the Dominion and to the increase in local interest in aviation.



Officers of 601 County of London Bombers' Squadron at Lympne for their Annual Training:—(Left to right, Back row)—F/O. Maclatchy, P/O. Sanders, P/O. Thynne, P/O. Murray, P/O. Du Cane, F/O. Belleville, P/O. Ward, F/O. Schreiber, F/O. Mahony, F/O. Haward (Second Row)—F/O. Norman, F/O. Langdon, Flight-Lieut. Whitehead Reid, Flight-Lieut. Thornton, Air Marshal Sir Edward Ellington, K.C.B., C.M.G., C.B.E., P.S.C., Flight-Lieut. Collett, Air Commodore E. L. Gerrard, C.M.G., D.S.O., Flight-Lieut. Parkes and F/O. Shaw. (Front Row)—F/O. Windham, P/O. Guinness, P/O. Seely, and P/O. Huntingdon Whiteley. Flight-Lieut. Thornton is commanding the Squadron owing to the illness and death of Lord Edward Grosvenor, and F/O. Langdon is Adjutant.

## CORRESPONDENCE

*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]*

### LOW "STUNTING"

[2206] An editorial is due on the subject of low stunting. Six out of the eight recent fatalities have been due either to this or rank carelessness. The two reserve officers recently killed at Coventry and London had each a reputation for reckless flying—and both got entirely what they asked for. Yet the newspapers are not capable of dissociating the two types of accident and flying gets a bad name.

When I was at Heston recently, a certain gentleman who shall be nameless gave an exhibition of nothing less than sheer foolishness for the benefit of a few friends on the ground, and nobody had anything to say to him because he was a well-known pilot. He did flick rolls below three hundred feet, looped at the same height, "fought" the hedges and hangars and generally pinned faith on his engine and ability. If the former had packed up half-way through his roll nothing could have saved him, and if he made a sloppy recovery the result would be equally messy.

August 19, 1929.

H.A.T.

### An Invitation

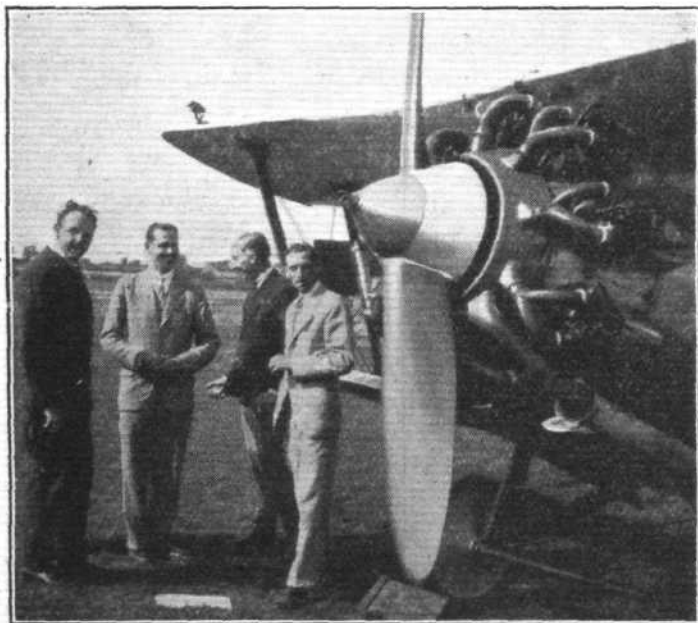
MESSRS. FIAT (ENGLAND), LTD., will be pleased to arrange a demonstration flight for anyone interested in the Fiat ASI monoplane exhibited at the recent Aero Show. Those of our readers who wish it should communicate with the Fiat Company at 43/44, Albemarle Street, London, W.1. Telephone, Gerrard 7946.

### Appointment

LIEUT. J. A. REECE, ex-war pilot, who saw service in India, Mesopotamia, France and England with the R.A.F., has joined the ground school staff of the Spartan School of Aeronautics, Tulsa, Oklahoma. Lieut. Reece's most recent occupation was with a whaling expedition on the Pacific, using a flying-boat which led the operations.

### The Junkers "Junior" D.7

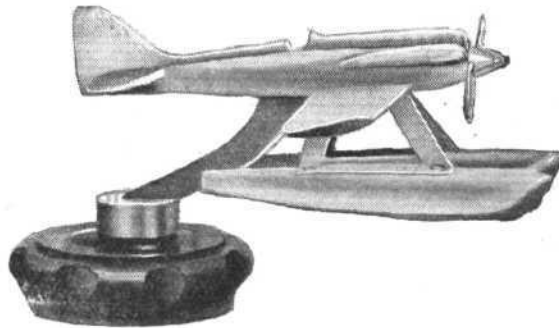
FOLLOWING upon the recent International light aeroplane competition at Orly, the Junkers "Junior" No. D.7 was flown home by Herr Ristic from Paris to Dessau via Milan. Carrying a passenger, he did the section from Milan to Munich in 1 hr. 50 mins., crossing the Alps at 12,000 ft. Continuing from Munich the same day, he reached Dessau in 2 hrs. 30 mins.



**Spanish Visitors to Filton:** The week before last Their Royal Highnesses the Archdukes Francisco and Antonio, cousins of the King of Spain, who are on a tour of Europe, arrived at Filton by "Moth," and inspected the Bristol works and machines. During the evening they were entertained at his home by Mr. H. J. Thomas, a director and works manager of the Bristol Co. The next day the visitors were given a civic luncheon by the Lord Mayor of Birmingham.

## Models of Schneider Trophy Machines

A. E. LEJEUNE, Ltd., the well-known manufacturers of high-class motor-car mascots, whose offices and showrooms are at 132, Great Portland Street, W.1, are producing very neat, carefully designed models of the Schneider Trophy machines. A perfectly dimensioned scale model of the S.5 machine with which Flight-Lieut. N. Webster won the Trophy in 1927 is 6 ins. in length, cast in solid bronze with a



silver-oxydised or bright-silver finish. Its price is £2 10s. A model of the Fairey monoplane which made the record non-stop flight to Karachi from Cranwell in 50 hours is another production of this company, also sold at £2 10s. It can be supplied as a paper-weight for an additional 5s. A. E. Lejeune, Ltd., produce models to customers' own designs. Their telephone number is Museum 1733.

## PUBLICATIONS RECEIVED

*Economic Conditions in Norway, 1927-1928.* Report by C. L. Paus, C.B.E. Department of Overseas Trade. H.M. Stationery Office, Kingsway, London, W.C.2. Price 2s. 1d. post free.

*Vickers, Limited and Its Interests.* Vickers, Limited, Vickers House, Broadway, Westminster, London, S.W.1.

*Dominion of Canada, Department of National Defence: Report on Civil Aviation and Civil Government Air Operations for the Year 1928.* Department of National Defence, Ottawa, Canada. Price 25 cents.

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## AERONAUTICAL PATENT SPECIFICATIONS

(Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

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Published August 29, 1929

15,010. W. POTTS. Means for propelling air and water craft. (316,717.)  
24,018. WASSER- UND LUFT-FAHRZEUG-GES. Valves for airships, balloons, etc. (296,702.)

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3,664. J. I. BYRNE. Hangars or sheds for aircraft. (305,474.)

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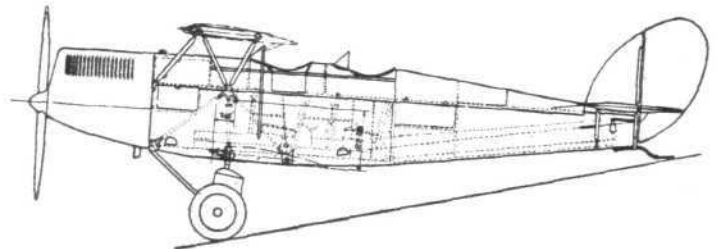
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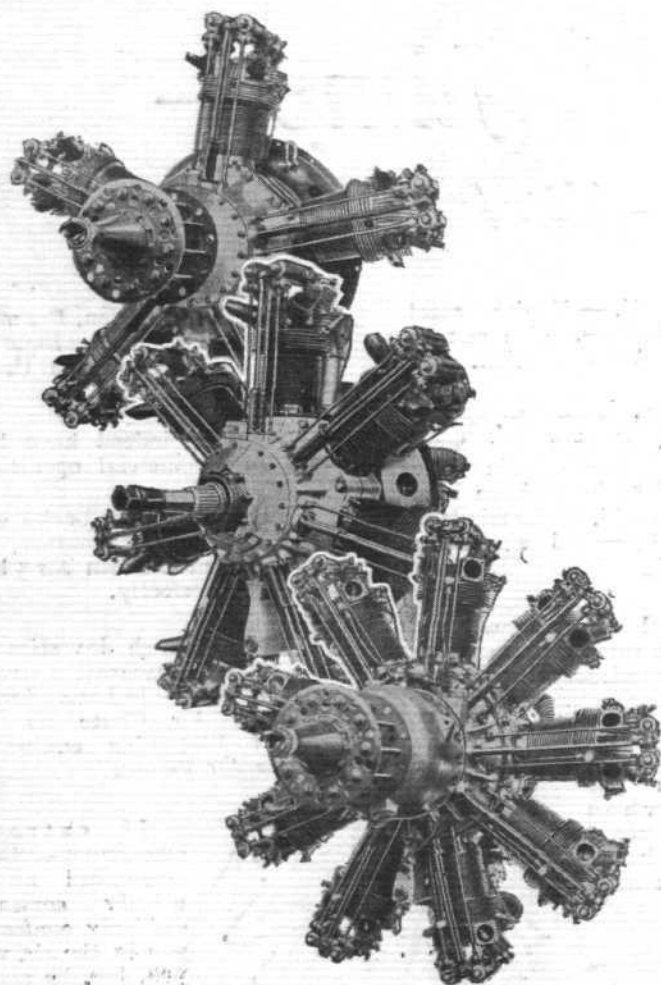
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